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NUGENT (T. J.). **Some notes on black rot of Kale in Virginia.**—*Plant Dis. Reptr*, xxiv, 4, pp. 84–85, 1940. [Mimeographed.]

Even in stands of kale raised from seed from which the black rot organism (*Phytomonas* [*Pseudomonas*] *campestris*) was eliminated by 20 minutes' immersion in 1 in 1,000 mercuric chloride [*R.A.M.*, xviii, p. 565], infection developed in varying amounts in recent experiments at the Norfolk (Virginia) Truck Experiment Station, denoting the existence of additional sources of inoculum, possibly in the soil or agricultural implements.

CABRAL (R. V. DE G.). **Gloeosporium concentricum (Grev.) Berk. et Br. na Brassica oleracea L.** [*Gloeosporium concentricum* (Grev.) Berk. & Br. on *Brassica oleracea* L.]—*Broteria*, ix, 1, pp. 18–41, 2 pl., 2 figs., 1940. [English summary.]

This is a comprehensive, tabulated account of the writer's studies in Lisbon on the cauliflower disease caused by *Gloeosporium concentricum* [*R.A.M.*, xix, p. 118] previously reported from Portugal by Moniz da Maia in *Rev. agron., Lisboa*, i, 3, 1918–20. The optimum temperature for the growth of the fungus was found to be between 18° and 20° C., at and below which on favourable media, such as Dox's agar, masses of moist, creamy spores, 6 to 14 by 2 to 4·5 (average 10·3 by 2·9) μ, are produced. At 22° to 25° the fungus forms spherical, black bodies, 140 to 270 μ in diameter, approximating closely to sclerotia, or rudimentary pycnidia or perithecia. Inoculation experiments on cabbages in the greenhouse and field with aqueous spore suspensions gave positive results, the normal incubation period ranging from 13 to 15 days. The high temperatures prevailing during May and June acted adversely on the development of the pathogen, thereby supporting the results of laboratory tests. Under natural conditions the disease affects cauliflowers in Portugal from March to May, but generally causes inconsiderable damage; the most conspicuous symptom of infection is the appearance on the leaves of the minute, snow-white acervuli of the fungus [an emended Latin diagnosis of which is given].

WALKER (J. C.). **Resistance to clubroot in varieties of Turnip and Rutabaga.**—*J. agric. Res.*, lix, 11, pp. 815–827, 1939.

In trials conducted with turnip and rutabaga (swede) varieties in Wisconsin soils [*R.A.M.*, xv, p. 547], turnips showed a wide range of resistance and susceptibility to *Plasmodiophora brassicae*, while most

of the swede varieties were highly resistant and none of the susceptible ones showed a high percentage of infection. These results agree, as regards turnips, with those obtained elsewhere [ibid., xvi, p. 223; xviii, p. 776], while the high resistance observed in swedes in Wisconsin, but not elsewhere, seems to indicate a possible variation in pathogenic selectivity within the species *P. brassicae*. A limited study of inocula from various widely separated parts of the United States showed on the whole little difference in their pathogenicity, although with some inocula low percentages of infection were obtained on the Snowball turnip and American Purple Top swede that had shown complete resistance to the Wisconsin inoculum.

NEUGEBAUER (E. A.). **Die Rübenblattfleckenkrankheit im Jahre 1939.** [The Beet leaf spot disease in the year 1939.]—*Dtsch. Zuckerindustr.*, lxv, 10, pp. 190–191, 1940.

High atmospheric humidity, coupled with temperatures round about 20° C., is a prerequisite condition for the rapid propagation of *Cercospora beticola* which was fulfilled in (Prussian) Silesia in 1939, when the precipitation in the district west and south of Breslau from 1st May to 30th September amounted to over 600 mm. Very satisfactory results in the control of the disease were obtained by spraying with 1 per cent. kupferkalk-Bayer-neu at the beginning of July, August, and September [cf. *R.A.M.*, xviii, p. 721]. The operations were facilitated by the use of a charlock spraying apparatus, by means of which it was possible to cover 5 hect. per diem instead of only one with a hand-sprayer; further improvements along the lines of the motor potato-sprayer, covering 10 hect. daily, are desirable. The loss of foliage among the treated plants was barely 20 per cent. compared with over 60 for the controls. The cost of the spray is estimated at Rm. 2 (400 l.) per hect.

REINKING (O. A.). **Incidence of disease in common-Bean-mosaic resistant and non-resistant Green Refugee Beans in New York, season of 1939.**—*Plant Dis. Reptr*, xxiv, 2, pp. 37–40, 1940. [Mimeographed.]

Field tests in New York in 1939 demonstrated that Idaho Refugee and U.S. 5 beans which are resistant to common bean mosaic [*R.A.M.*, xviii, p. 430] clearly out-yielded the non-resistant Stringless Green Refugee bean, especially where the last-named was severely affected. Also, U.S. 5 gave rather larger yields than Idaho Refugee. Both the resistant varieties in commercial field plantings remained unaffected, while Stringless Green Refugee developed nearly 100 per cent. infection in all fields. All three types were equally affected by yellow mosaic [ibid., xv, p. 418].

One-sided variegation, identical with Zaumeyer's heritable abnormality resembling mosaic [ibid., xviii, p. 7], was confined (in these experiments) to the hybrid Idaho Refugee bean and one of its parents, the non-commercial Corbett Refugee bean. It is, apparently, being selected out of new strains, and is not present in a severe form in commercial strains of U.S. 5 or the Stringless Green Refugee.

The evidence indicated that Idaho Refugee and U.S. 5 are more susceptible to *Phytomonas* [*Bacterium*] *phaseoli* and *P.* [*Bact.*] *medicaginis phaseolicola* [ibid., xviii, p. 366] than is Stringless Green Refugee.

Goss (R. W.). **The relation of temperature to common and halo blight of Beans.**—*Phytopathology*, xxx, 3, pp. 258–264, 1 fig., 1940.

In greenhouse trials under controlled conditions at the Nebraska Agricultural Experiment Station common blight of beans (*Phaseolus vulgaris*), caused by *Phytomonas* [*Bacterium*] *phaseoli*, was induced by inoculation on the susceptible Red Kidney variety at all temperatures tested between 16° and 32° C., the appearance of the symptoms, however, being greatly retarded at the lower end of the scale; the incubation periods at 16°, 20°, and 32° were 27, 23, and 7 days, respectively. The transference of plants from low to high temperatures resulted in the rapid development of symptoms on apparently healthy foliage, but the amount of diseased leaf tissue was greatest on the plants maintained constantly at the higher temperatures. The oldest leaves of the young plants tested proved more susceptible than the ones unfurling at the time of inoculation.

Halo blight (*P.* [*Bact.*] *medicaginis* var. *phaseolicola*) followed inoculation at all temperatures tested between 12° and 32°, the halo being most prominent at 20° and below and absent at 28° and 32°, where it was replaced by an abundance of small, inconspicuous spots, accompanied by bacterial exudate on the under leaf surfaces. The youngest leaves were the most susceptible to infection. Halo blight, unlike the common form of the disease, caused little damage to the primary leaves.

The relative humidity after a 24-hour incubation period at high humidity did not affect the virulence of halo blight, but a low atmospheric moisture content accentuated the severity of the symptoms on foliage suffering from common blight.

Person (L. H.). **Further studies on control of soil rot of Sweet Potatoes.**—*Proc. Ass. Sth. agric. Wkrs*, xl, pp. 179–180, 1939. [Abs. in *Chem. Abstr.*, xxxiv, 8, pp. 2525, 1940.]

Applications of sulphur at the rate of 600 to 800 lb. per acre [? in Louisiana] lowered the P_H value of the soil from between 5·8 and 6 to between 4·8 and 5, and permitted the normal growth of sweet potatoes, which in the absence of this treatment remained stunted, developed chlorosis, and were killed in large numbers by soil rot [*Actinomyces* sp.: *R.A.M.*, viii, p. 598; xi, p. 535]. Moreover, the sulphuring of heavily infected soils increased yields from practically nil to 75 to 115 crates of U.S. 1 and 2 grades.

Horsfall (J. G.) & McDonnell (A. D.). **Varietal susceptibility of Peppers to bacterial spot.**—*Plant Dis. Reptr*, xxiv, 2, pp. 34–36, 1940. [Mimeographed.]

In September, 1939, *Phytomonas vesicatoria* [*Bacterium vesicatorium*] developed in an epidemic form on a large variety and strain collection of peppers [*Capsicum annuum*: *R.A.M.*, xvi, p. 302] in Connecticut, appearing primarily on the foliage, and causing typical scabby spots and defoliation. The plants were divided according to degree of infection into the following categories: (1) unaffected, (2) with a few leaf spots, (3) severely spotted, slight defoliation, (4) up to 50 per cent. defoliation, and (5) over 50 per cent. defoliation. The average of all replicates gave an index of disease. The varieties were then grouped according to

whether the disease index fell between 1 and 2 (resistant), 2 and 3 (somewhat resistant), 3 and 4 (somewhat susceptible), or 4 and 5 (susceptible).

Group 1 was found to include all ten strains of Waltham Beauty under observation, two of yellow Oshkosh (from which Waltham Beauty was selected), a cross between Waltham Beauty and the susceptible Pimiento (three strains), Sunnybrook 833, a Sunnybrook selection, and Sunnybrook Crosses. All of three strains of Squash were resistant, as were a few strains of Wonder. Harris Earliest and Harris Early Giant appeared to be resistant when coming from one source, but only fairly resistant when coming from another. Bullnose was resistant. Group 2–3 included all strains of Windsor A and B, most of the strains and selections of California Wonder, two strains of Asgrow King, Improved World Beater, and all strains of Improved Colossal. Group 3–4 included most of the Giant strains, the rest of the California Wonder and most of the Ruby King strains, a few strains of King of the North, Special Cheese, and Neapolitan. Most of the strains of World Beater and King of the North, Pimiento, Rocky Ford, Colossal, Cornelli's Special, Talionelli, Sweet Mountain, and Prolific Sweet were very susceptible.

It would appear that resistance is probably inherited as a dominant. Resistant Waltham Beauty crossed with susceptible Pimiento gives resistant progeny. Resistant Sunnybrook gives resistant progeny when crossed with Harris Early Giant, Cay, or Sweet Cheese. Resistant Harris Early Giant crossed with susceptible California Wonder gives resistant progeny.

Hemmi (T.). **Studies on septorioses of plants. VI. Septoria glycines Hemmi causing the brown spot disease of Soy Bean.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 1–14, 1 pl., 1940.

Brown spot disease of soy-beans (*Septoria glycines*) [*R.A.M.*, vi, p. 74; xix, p. 256] is stated to be very prevalent on the leaves of plants cultivated along the raised footpaths between the rice fields near Kyoto, Japan, though less destructive in the locality under observation than in the north of the country. The first symptoms of infection in the early summer are brown or pale reddish-brown, slightly raised, angular, sharply defined spots, gradually turning dark to blackish-brown, on both leaf surfaces. The diseased foliage is prematurely shed from the base upwards.

The fungus readily produced pycnidia and pycnospores on potato decoction agar plus sucrose. The globose or subglobose, thin-walled, brown, ostiolate pycnidia measure 44 to 125 μ in diameter, and the filiform, hyaline, mostly irregularly curved, rarely guttulate, uni- to quadricellular spores 16·6 to 52·5 by 1·3 to 2·1 μ on the leaves and 22·4 to 48 by 1·3 to 2·1 μ in culture. The pycnospores germinate by means of one or two germ-tubes in 24 to 50 hours in water or on a nutrient medium, the swollen cells sometimes separating and developing within 48 hours into secondary conidia. The minimum, optimum, and maximum temperatures for the growth of the fungus on various standard media were found to be 5°, 24° to 28°, and 36°, respectively. Pycnospore formation was not affected by light or darkness, but tended to proceed more rapidly under the influence of fluctuating temperatures.

Inoculation experiments with spore suspensions of *S. glycines* from agar cultures on the leaves of young soy-bean plants maintained at 24° to 25° for 24 hours in moist chambers and then transferred to a greenhouse gave positive results after an incubation period of 10 to 14 days. The fungus was further shown to be capable of inducing fresh outbreaks of leaf spot by means both of seed- and soil-borne infection.

Liu (K.). **Studies on a Fusarium disease of Soy Bean pods.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 15–29, 2 pl., 1940.

Pure cultures of the agent of a destructive pod blight of soy-beans [cf. *R.A.M.*, xi, p. 88] interplanted with rice in the Kyoto district of Japan, were compared with similar material of *Gibberella saubinetii* (suggested as the cause of the disease by Hara and Miura) and *G. fujikuroi* (responsible for the 'bakanae' disease of rice) and found to be distinct. Morphologically the fungus is identical with *Fusarium bulbigenum* var. *tracheiphilum*. Under natural conditions in the locality under observation the pathogen is confined to the pods, on which it produces brownish lesions, gradually enlarging to involve almost half or more of the surface. In advanced stages the pods bear flesh- or salmon-coloured sporodochia of the fungus. Pods infected when young generally shrivel and dry without forming seeds, whereas on older ones the lesions are limited by a brownish line and permit partial development of seeds which are sometimes attacked by the fungus. In moist chamber and greenhouse inoculation experiments with conidial suspensions the unwounded pods and stems became affected, though the latter remained healthy for a long time. The infection of the stems is of some interest in view of the occurrence of the fungus on soy-bean roots and stems in the United States [ibid., xix, p. 256].

Conidial germination and germ-tube growth tended to decrease under the influence of daylight. Germination took place readily in drops of conidial suspension but after the drops were dried it was very considerably reduced in an atmosphere of 100 per cent. humidity and did not take place at all at 99 per cent. The optimum temperature for the process appears to lie at about 24° C., within the range 16° to 36°.

Miller (L. I.). **Control of leafspot of Peanuts in Virginia—1939.**—*Plant Dis. Reptr*, xxiv, 3, pp. 63–64, 1940. [Mimeographed.]

In field experiments in Virginia in 1939 the best control of leaf spot of groundnuts (*Cercospora*) [? *arachidicola* and *C. personata*: *R.A.M.*, xviii, p. 433; xix, p. 62] was given by four to five fortnightly applications of sulphur dust beginning on 1st or 15th July, the average number of spotted leaflets being 43 per cent. as against 86 in the untreated control plots, the corresponding figures for three to four treatments commencing 15th July and 1st August and for three applications starting 15th August being 55, 60, and 73 per cent., respectively. The average net profit from the increased yields in the dusted plots was $18·00 per acre.

Lykiardopoulo (T. L.). **À propos du court-noué.** [On court-noué.]—*Progr. agric. vitic.*, cxiii, 1, pp. 12–13, 1940.

The author states that he has observed court-noué disease of the

vine in localities in Greece in which *Phylloxera* [*vastatrix* f. *radicicola*] is not known to be present [*R.A.M.*, xix, p. 67]; he has also noted the disease on ungrafted *Vitis vinifera* vines. In Greece, court-noué usually appears in low-lying, damp localities, most often in argillaceous-calcareous soils. Locally, vines are planted so closely that the roots meet, and the condition spreads from an affected vine to that nearest to it. When an affected vine is removed and a healthy vine at once planted on the same site, the latter becomes affected within two or three years.

Du Plessis (S. J.). **Anthracnose of the Vine.**—*Fmg S. Afr.*, xv, 168, pp. 97–100, 104, 6 figs., 1940.

Anthracnose [*Elsinoe ampelina*: *R.A.M.*, xvii, p. 221; xviii, p. 502; xix, p. 366] is stated to be one of the oldest vine diseases found in the winter-rainfall area of Cape Province, South Africa, where several vineyards, mostly of the Sultana variety, in the districts of Robertson and Swellendam have been uprooted owing to its ravages.

Rains are highly conducive to attack. A moist period is a primary requisite for spore formation on the affected surfaces, and if it continues for some time the liberated spores may spread to susceptible parts of the vine. The evidence showed that a semi-epidemic outbreak may follow two short successive rains of even less than ½ in. each. As the young growth is very susceptible, irrigation largely increases the proportion of susceptible parts. Some varieties, e.g., Sultana, Henab Turki, and Waltham Cross, are highly susceptible, and in most areas need regular treatment; Barlinka and Cabernet are more resistant, and show marked symptoms only in seasons unusually favourable to infection, while Gros Colman, Raisin Blanc, and Steen are seldom if ever attacked.

The experimental evidence obtained demonstrated that excellent control is obtainable by spraying with sulphuric acid (4 per cent.), lime-sulphur (1 in 8), or copper sulphate (1 lb. to 2 gals. water) towards the end of winter, when the buds are well swollen. Weaker solutions of copper sulphate were ineffective, but lime-sulphur, even at 1 in 20, gave very satisfactory results. Winter spraying with copper sulphate gave marked increase in yield, representative figures being 6, 12, and 15 lb. of grapes per vine for no treatment, lime-sulphur (1 in 8), and copper sulphate (1 lb. in 2 gals.), respectively.

The data also showed that winter spraying is the most important form of treatment, and that coverage must be thorough. Infected material should be removed and destroyed at pruning. Debarking is not necessary, but weed removal facilitates treatment. A summer treatment is recommended in addition, except when infection is very slight; spraying with copper sulphate in winter, followed by dusting with verderame in summer, gave 99·9 per cent. control in severely infected vineyards. In general, three treatments should be made, (*a*) when the shoots are about 6 in. long, (*b*) when the flower caps have fallen, and (*c*) about three weeks later. The actual time of application largely depends on the rainfall experienced. Fungicides found to be more or less equally effective as summer treatments included copper sulphate dust, verderame (spray or dust), verderame sulphur dust (80–20), Bordeaux mixture (4–4–50), perenox (cuprous oxide) spray or

dust, and a basic preparation of copper sulphate (spray or dust). Adequate applications of pure sulphur were almost as good as pure copper carbonate with clay, and both fungicides were better pure than mixed. As most farmers regularly treat the vines with sulphur against *Oidium* [*Uncinula necator*] it would probably be found cheaper to use sulphur also for anthracnose.

Combating mould in Grapes.—*Fruit World, Melbourne*, xli, 3, p. 4, 1940.

It is stated that it is a common practice in California to fumigate trucks of grapes with sulphur dioxide to retard the development of moulds [unspecified] in transit [*R.A.M.*, xix, p. 287]. Treatment in most cases affords protection for two or three weeks. If grapes intended for longer storage cannot be refumigated, sodium bisulphite, which releases sulphur dioxide, is added to the package, the technical grades of powdered sodium bisulphite and sodium metabisulphite having been found suitable. In lug packs the chemical is sifted into the pad on which the grapes are packed. Only 5 gm. of sodium bisulphite should be added to the package, and the powder should be evenly distributed through the sawdust or pad, and should not come into direct contact with the fruit; sodium bisulphite should not be used if the fruit or sawdust is wet.

Servière (H.). **Chronique. Organisation de la défense contre les attaques du mildiou.** [Current notes. The organization of defence against mildew attacks.]—*Progr. agric. vitic.*, cxiii, 10, pp. 197–199, 1940.

To avoid unnecessary use of copper sulphate in the control of vine mildew [*Plasmopara viticola*] the author recommends the suppression of the primary foci of infection in damp places, which favour the germination of soil-borne winter spores, by removing the buds and the leaves at the base of low stocks and grafts before any signs of the disease appear. The practice should be carried out even in abandoned vineyards, and growers should collaborate in this part of the work.

Vivet (E.). **Échelonnement des traitements contre le mildiou.** [The intervals between mildew treatments.]—*Rev. Vitic., Paris*, xcii, 2389, pp. 176–177, 1940.

In discussing the frequency with which spray treatments against vine mildew [*Plasmopara viticola*] should be applied in Algeria [cf. *R.A.M.*, ii, p. 104], the author states that under the conditions prevailing locally initial leaf infection arising from winter spores is generally very slight, only very few of these organs being produced in autumn, even on the most susceptible varieties. Locally, the first leaf lesions appear, in five years out of six, during the first fortnight in May, though in some years they may develop much earlier (29th March in 1936 and at the end of April in 1939). In the coastal regions the first spray application should be made as soon as the shoots are 6 to 8 cm. long. This should be followed by another a week later. In wet places a supplementary application is advised in order to delay initial infection as much as possible, and to obviate the development of leaf-spotting during the fortnight preceding flowering. Observations by P. Aldebert

in 1939 demonstrated that the period elapsing between contamination and the appearance of the fructifications may be as short as four days, and under such conditions the vines should be sprayed twice in the same week.

A year's progress in solving farm problems of Illinois.—*Rep. Ill. agric. Exp. Sta., 1936–37*, 351 pp., 32 figs., 35 graphs, 5 maps, 1939. [Received April, 1940.]

In this report [cf. *R.A.M.*, xvii, p. 379] B. Koehler states that resistance in maize to ear rots (*Diplodia* [*zeae* and *D. macrospora*], *Fusarium* spp., *Gibberella* [*saubinetii*] and *Nigrospora* sp.) [ibid., xvi, p. 169] is not inherited as a unit. In breeding for ear rot resistance, each rot must be taken separately. With Station Yellow Dent maize as a standard of comparison, Illinois Hybrid 172 showed resistance to all four rots, and outstanding resistance to *Diplodia* and *Fusarium* rot, which usually cause the most damage; other hybrids were resistant to certain rots. Evidence showed that artificial lodging may be of use as a rapid test for determining resistance to ear rots.

E. E. De Turk, E. B. Earley, and J. R. Holbert working with two single crosses of yellow dent maize, one (R4 × Hy) highly resistant to low temperature injury and to stalk rot due to *D.* [*zeae* and *D. macrospora*], and the other (Lan × R313) susceptible to these conditions, found that the greater the percentage of total sugars the less the injury produced by either cause. The hybrid R4 × Hy averaged 29 per cent. more total sugar than Lan × R313 in the lower, middle, and upper parts of the stalk, and 8 per cent. more in the shank. In both hybrids, reducing the area of the leaves by 30 per cent. lowered the sugar content of the stalks and the resistance of the plants to both conditions. Stalk injury due to cold and rot was uniformly distributed over the plants, but tended to follow the reduced sugar concentrations.

Outbreaks of wheat mosaic [ibid., xviii, p. 661] occurred for the first time in seven more Illinois counties, in addition to the 17 counties in central and south-central parts of the state where extensive areas of soil are infected. In the seven new counties losses on different farms ranged up to 90 per cent. of the crop. Severe damage resulted from a combination of thorough soil infection, seasonal conditions favouring the disease, and the planting of highly susceptible varieties. In some varieties mosaic produces a high percentage of severely stunted plants which fail to head. In others, such as the high-yielding hard red wheats Brill and Cheyenne, the leaves are mottled and occasionally dwarfed, but the plants head out; in tests with these varieties, loss of yield amounted to 35·9 per cent. in the former and 47·4 per cent. in the latter. Almost all the hard red winter wheats grown in Illinois, including Turkey Red, were ascertained to be susceptible to considerable injury by mosaic, though Ibred seems to suffer less damage than others. Of the soft wheats, Fulcaster, Fulhio, Duffy, Nabob, and Wabash are mosaic resistant.

B. Koehler found further proof that ethylmercury phosphate (new improved ceresan) acts to some extent as a gas during dry storage of treated grain [ibid., xix, p. 142]. Within limits, the longer the storage period the less the amount of the disinfectant required to control cereal

smuts. With a storage period of a month or more the dosage should be reduced to ¼ oz. per bush. of grain, this treatment giving almost as good results as ½ oz. applied a day before sowing.

Stationary spraying plants are becoming increasingly popular with fruit growers in Illinois, mainly because underground pipes permit spraying to be carried on when the ground is too wet to allow portable units to be used [ibid., xix, p. 295].

During a dry season Bordeaux mixture should not be used without oil in the first and second cover sprays on apple trees, as the transpiration induced is too rapid.

Strawberry 'brown stele' [ibid., xvii, p. 380; cf. also xix, p. 107] is favoured by soil with a high water-holding capacity. Crosses between the resistant Aberdeen and Mastodon varieties are being tested under field conditions.

Thirteenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1939.— 110 pp., 8 figs., 1 map, [? 1939. Received June, 1940.]

Among the items of interest in this report [cf. *R.A.M.*, xviii, p. 656] the following may be mentioned. From tests on samples of the 1939 Tasmanian apple crop taken in January and February, and consideration of the seasonal climatic conditions, forecasts were made of the probable storage qualities of the chief commercial varieties. Such forecasts have been made with reasonable accuracy for several seasons; they provide a very useful guide for planning picking programmes and storage schedules to minimize wastage. In tests with Sturmer and French Crab apples stored in artificial atmospheres liability to brown heart [ibid., xvii, p. 463] and alcoholic poisoning [loc. cit.] increased with carbon dioxide concentration and fruit maturity, but decreased with temperature over the range 33° to 44° F.

When wheat was grown in soil with added excess of potassium salts and of ground magnesite, whiteheads [usually caused by *Ophiobolus graminis*: ibid., xviii, p. 733] developed, indicating that there may be some justification for the view that whiteheads in the field are sometimes due to physiological factors.

In northern Queensland the adoption by tobacco-growers of the methods recommended for the control of *Cercospora* [*nicotianae*: ibid., xvii, p. 376] has resulted in the disease being reduced from major to very minor importance. During the period under review the worst recorded outbreak of tobacco yellow dwarf [ibid., xvii, p. 75] occurred, many fields in Victoria being abandoned because of the disease. Tests of the insect transmission of yellow dwarf gave inconclusive results, but transmission to Solanaceous plants was effected by grafting. In seed-bed experiments against downy mildew [*Peronospora tabacina*: ibid., xix, p. 439] cuprous oxide spray and paradichlorbenzene in conjunction with cover treatments gave unsatisfactory results, but the use every night of an evaporation surface of benzol equal to one-hundredth of the seed-bed area, together with wetting of the seed-bed covers proved satisfactory, and is recommended.

During 1939, 70 per cent. of 89 *Pinus taeda* and *P. caribea* trees affected with needle fusion [ibid., xviii, p. 502] and treated with borax

showed reduction or absence of symptoms in the growth made during the season after treatment. The corresponding figures for 23 trees treated with superphosphate and 102 untreated controls were 26 and 16 per cent., respectively. In spite of the reduced severity of the symptoms in those trees that responded to borax, the treatment gave little increase in vegetative vigour. Grafting experiments indicated that certain individual trees may be genetically much more susceptible than others.

Preliminary tests of the rate of leaching and change in composition of creosote oil impregnated into wood immersed in sea water indicated a moderately rapid loss of the portions of the creosote distilling below 230° C., loss under sea water occurring at about the same rate as in moderate air conditions.

Further studies on the decay of jarrah [*Eucalyptus marginata*] in service indicated that under moist conditions *Coniophora cerebella* [*C. puteana*] is generally the cause. The fungus also causes extensive rotting in the living tree. A decay of jarrah and many other timbers characterized by abundant longitudinal penetration of the fibre walls, parallel to the long axes of the fibres, and either vertical or helical, was caused by a non-Basidiomycete. In further studies on *Fistulina hepatica* [ibid., xviii, p. 72] no evidence was obtained of typical rotting by this fungus in *E.* spp. The fungus associated with 'heart' in *E. regnans* has now been determined as a species of *Gonytrichum*, and not specifically as *G. caesium* [ibid., xviii, p. 656].

Experimental evidence indicated that a temperature of 50° F. is the most satisfactory one for storage of Washington Navel and Valencia late oranges susceptible to storage spot [ibid., xviii, p. 657], while mould [chiefly *Penicillium digitatum* and *P. italicum*] is best controlled by one of 37° to 40°. Mould wastage is generally greatest on fruit picked after heavy rain. Preliminary sweating at 70° to 90° reduced wastage from storage spot and mould, but the effect varied from year to year, from grove to grove, and with maturity and the conditions obtaining before picking. In one lot of oranges there was a critical moisture loss of 3 to 4 per cent., beyond which increased water loss led to greater wastage. In Valencia late oranges, wastage from *Penicillium* infection and storage spot was reduced by treatment with a wax emulsion and the use of diphenyl wraps. Borax treatment of Washington Navel oranges reduced mould wastage but increased storage spot. After seven weeks' storage at 37°, 40°, and 45°, Emperor Mandarin oranges from two groves showed least and most wastage at 40° and 45°, respectively, wastage being also decreased by preliminary washing with 1 per cent. caustic soda or 8 per cent. borax. With clipped fruit, borax gave better results than soda, while with pulled fruit the reverse obtained.

When Waltham Cross and Ohanez grapes packed in cork treated with iodine, sulphur, iodoform, diphenyl, and o-phenylphenol were stored [cf. ibid., xix, p. 287] the most promising results in the control of mould [unspecified] were given by iodine, though it slightly tainted the fruit.

Simmonds (J. H.). **Report of the Plant Pathological Section.**—Ex *Rep. Dep. Agric. Qd, 1938–9*, pp. 25–28, 1939.

The following items of interest occur in this report on plant disease work in Queensland [cf. *R.A.M.*, xviii, p. 502]. Locally, the severity

of wheat flag smut [*Urocystis tritici*: ibid., xix, p. 397] appears to be closely bound up with weather conditions, in some seasons scarcely any infection being present anywhere in the wheat belt.

A survey of lucerne diseases in South Queensland showed that the chief troubles are witches' broom and root rots. The former is due to a virus [ibid., xiv, p. 516], and is fairly generally distributed; it may seriously affect production in the older stands. Several distinct types of root trouble produce yellowing and death of individual plants. One type, due to *Sclerotium rolfsii* [ibid., xiii, p. 290] is somewhat widely distributed, and in some instances probably causes a definite reduction in stand, while another, caused by *Helicobasidium purpureum* [ibid., xvii, p. 326] has been found only on one farm.

Mercurial seed dressing for preventing germination losses and wilt [cause unspecified] in groundnuts has given uniformly good results. The crop is also affected by three distinct types of virus disease, none of which appears to be identical with rosette.

Field trials of different methods for the control of tobacco blue mould [*Peronospora tabacina*: see preceding abstract] indicated that when *Cercospora nicotianae* is also to be taken into consideration spraying with colloidal copper, supplemented by benzol fumigation during very wet periods, is advisable.

Field inoculation tests showed that infection of pineapples with the *Penicillium* species mainly responsible for brown speck disease [ibid., xiv, p. 216; xviii, p. 503] occurs during the flowering stage. Typical lesions develop only as the fruit reaches maturity, and vary in extent in different fruits. Experimental evidence indicated that the fluctuation observed in the incidence of pineapple marbling [loc. cit.] is due to the conditions prevailing during flowering, when natural infection by the causal bacteria probably occurs. Typical symptoms of the disease resulted from inoculations on the Ripley variety. Serious black heart [loc. cit.] was again found to be associated with poor quality of the fruit. H. K. Lewcock (p. 33) states that the occurrence of the condition is closely connected with carbohydrate metabolism. Shading the plants for one month before picking increased black heart incidence, but complete defoliation four to six weeks before fruit maturation did not. The amount of sunlight available to the plants appears to be one of the chief factors conditioning the development of the disorder, fruit on southerly slopes being more frequently affected than those on northerly ones. Similarly, fruit from the northern side of a double row is often less affected than fruit from the southern side. There is some indication that too close planting may increase incidence, and that excessive application of ammonium sulphate in autumn may predispose to the condition. Fruit picked in the early stages of ripening was affected to a greater extent in storage than immature or completely ripe fruit. The condition occurs more often in fruits with a whitish opaque flesh than in those with translucent flesh.

In tests of the effect of zinc applications on sclerosis or 'crookneck' of pineapple [ibid., xviii, p. 503] zinc sulphate applied to the soil in the form of the crystalline salt mixed with the fertilizer (first application) gave much better results than zinc sulphate used as a spray, the former method completely inhibiting the appearance of symptoms.

Following certain weather conditions in the field an appreciable amount of water blister (*Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xi, p. 192]) develops on pineapples in transit, and the evidence obtained clearly demonstrated that the greatly increased loss from water blister that has been sustained in recent years has resulted from a corresponding increase in side or skin infections as compared with those of the stem-end. In 3,629 fruits examined, 921 side and only one stem-end infection were found. It is therefore evident that treatment of the cut stem with benzoic acid will not control the condition. The extent to which side infections develop varies with the degree of spore contamination and the amount of care exercised in picking and packing. Control is complicated by the limitations necessarily imposed by public health regulations on the range of fungicides which might be used, and by the difficulty in finding any fungicide that will adhere to the whole of the fruit surface. So far, the best results (though not amounting to complete control) have been obtained by immersing the fruit within two hours of picking in shirlan AG, but there are difficulties in this method that may render it unacceptable.

A brief survey of strawberry virus diseases showed that yellow edge [see below, p. 481] and crinkle [ibid., xviii, p. 537] were prevalent on the South Coast, the former predominating. Very little crinkle was observed on the North Coast, though yellow edge was fairly common. Under local conditions neither disease need become serious, if due attention is paid to roguing and the selection of healthy mother plants.

In comparative tests, Bordeaux mixture (4–8–40) gave no better adherence to tomato leaves than 4–4–40 or 4–2–40 mixtures, and *P*[*hytophthora*] *infestans* was equally well controlled by all three. In tests of varietal resistance to *Fusarium* [*bulbigenum* var.] *lycopersici*, the best results were given by Rutgers [cf. ibid., xviii, pp. 726, 766].

Onion smut (*Urocystis cepulae*) was recorded for the first time.

Observations in northern Queensland on root rot (*Fomes pachyphlocus*) [ibid., xii, p. 56] of maple, kauri pine [*Agathis australis*], and hoop pine [*Araucaria cunninghamii*] indicated that incidence decreases when the stumps of rain forest trees, left after the burn, reach an advanced state of decay, by which time the fungus has lost much of its activity.

Hoop pine seedlings were affected by two forms of chlorosis, one lime-induced, the other due to nitrogen deficiency brought about by using a sawdust cover for the seed-bed.

Experimental evidence indicated that the mycorrhizal fungus of hoop pine is closely allied to, if not identical with, *Boletus granulatus* [ibid., xviii, p. 406]. The typical *B. granulatus* mycorrhiza is ectotrophic on *Pinus*, but endotrophic on *Araucaria*.

Plant pathology.—*Rep. Hawaii agric. Exp. Sta., 1939*, pp. 69–74, 1940.

In this report on plant disease work in Hawaii in 1939 [cf. *R.A.M.*, xviii, p. 657] it is stated that evidence was obtained that tomato ring spot [loc. cit.], is caused by the virus of pineapple yellow spot [see below, p. 482], which was mechanically transmitted from affected tomato to healthy tomato, potato, and *Emilia sonchifolia*, from affected to healthy *E. sonchifolia*, and from affected potato to healthy potato

and tomato. The virus was also transmitted by grafting from tomato to tomato and potato, and from potato to tomato. The available evidence strongly suggests that the pineapple yellow spot virus is identical with the [tomato] spotted wilt virus.

In a comparative test against early blight (*Alternaria solani*) of potatoes, the best control was given by Bordeaux mixture (4–2–50).

Dermen (H.) & Brown (Nellie A.). **A cytological study of the effect of colchicine on plant tumors.**—*Amer. J. Cancer*, xxxviii, 2, pp. 169–190, 10 figs., 1940.

Tumours artificially induced in marigolds (*Tagetes patula* and *T. erecta*) by inoculation with *Bacterium tumefaciens* were killed by effective doses of colchicin (0·1 to 1 per cent.) [*R.A.M.*, xviii, p. 446], death being due to multipolyploidy in the affected meristematic cells, which are thus prevented from dividing and increasing numerically. The growth of both the treated and control tumours proceeded normally for the first week, after which the development of the former ceased; three days later darkening and shrivelling set in. In further tests with lower concentrations of colchicin, a minimum of 0·01 per cent. was found to be necessary to produce any effect on *T. patula* tumours, the increase in nuclear size (restricted to the periphery) being conservatively estimated at four times the normal and the corresponding increases for the 0·025, 0·05, and 0·1 per cent. doses being 8, 16, and 32 times the normal, respectively, with a maximum number of chromosomes 32 times the normal (48), i.e., 1536. At a maximum estimate, the increase of chromosomes in the tumours treated with colchicin at a strength of or exceeding 0·1 per cent. would be 512 times the normal or 24,576 in the largest observed nuclei.

Attention is drawn to an important difference, having a direct bearing on methods of therapy, between the reactions to colchicin of plant and animal cells.

Conn (H. J.), Wolfe (Gladys E.), & Ford (M.). **Taxonomic relationships of Alcaligenes spp. to certain soil saprophytes and plant parasites.**—*J. Bact.*, xxxix, 2, pp. 207–226, 4 figs., 1940.

In comparative experiments at the New York (Geneva) Agricultural Experiment Station with six species of *Rhizobium* from legumes, *Alcaligenes* and *Chromobacterium* spp., miscellaneous soil bacteria, and eight plant pathogens, *Bacterium tumefaciens* showed the closest similarities to the legume nodule organisms [cf. *R.A.M.*, xix, p. 202], with which it agrees even in the production of gum on sugar media. The crown gall agent, *Bact. rhizogenes*, *Pseudomonas savastanoi*, and *Bact. gypsophilae* [ibid., xiii, p. 772] show the same type of degenerate peritrichous flagellation as *R.* spp., as well as other characteristics described under the latter genus. Of the three strains of *Aplanobacter michiganense*, two exhibit the *R.* type of flagellation while the third is apparently non-motile. It is concluded that the plant pathogens approximating most nearly to the legume nodule bacteria should be referred to the Rhizobiaceae, the question of the disposal of the non-motile organisms being temporarily left open.

Gioelli (F.). **L'azione di filtrati di 'Bacterium tumefaciens' su culture 'in vitro' di tessuti vegetali.** [The action of filtrates of *Bacterium tumefaciens* on cultures of plant tissues *in vitro*.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 117–135, 5 figs., 1940.

Experimental evidence [which is described in detail] is adduced to show that an extract of the filtrates from cultures of *Bacterium tumefaciens* [*R.A.M.*, xix, p. 201] added to cultures of plant tissue (i.e. cambial tissues of *Sterculia platanifolia* in Knop's solution) *in vitro* functions as a growth hormone in the same way as the hetero-auxin indoleacetic acid is known to act. It is concluded that *Bact. tumefaciens* produces neoplastic proliferations by the action of chemical substances of the nature of hormones, which stimulate cellular division even in tissues outside the infected area.

Andrén (F.). **Resultatet från betningsförsök.** [Results of disinfection experiments.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1940*, 1, pp. 3–7, 1940.

In this account of further cereal seed-grain disinfection experiments in Sweden in 1939 [*R.A.M.*, xix, p. 267], the writer tabulates and discusses the data obtained in combined disease control and yield tests in various centres. All the preparations used, namely, tutan, abavit-neu, fusariol, and uspulun dusts (each at the rate of 200 gm. per kg.), germisan and uspulun steeps (0·125 per cent. for 30 mins.), and uspulun sprinkle (50 gm. per 3 l.), were effective against wheat bunt [*Tilletia caries* and *T. foetens*], the average incidence of which among the untreated lots was 25·7 per cent. The maximum yield of 4,680 kg. seed per hect. (30·7 per cent. above the control) was obtained with tutan (200 gm. per kg.), but as regards the elimination of infection there was little to choose between the fungicides, all of which reduced the percentage of bunt to under 1 (0·2 for tutan); generally speaking, however, dry materials are preferable to liquid for the control of this disease.

Rye fusariosis [*Calonectria graminicola*] was not severe even in the untreated samples, but nevertheless substantial increases in yield followed disinfection, the maximum of 16·8 per cent. above the control being obtained with 0·125 per cent. germisan (30 minutes' immersion).

Barley stripe [*Helminthosporium gramineum*] was most effectively combated by abavit-neu (200 gm.) and the new oil-soluble panogen (175 gm.), both of which reduced infection to the merest trace; satisfactory results were also secured with uspulun [ceresan] U.T. 1875b (200 gm.), 30 minutes' immersion in 0·125 per cent. uspulun, uspulun sprinkle (2·5 per cent. per 3 l.), and a 30-minute dip in 0·125 per cent. fusariol 2115. Both germisan dust (200 gm.) and germisan retorte (0·125 per cent., 30 minutes) proved superior to the older brand of germisan and to tutan, the last-named, in fact, being the least valuable of all the preparations in current use against barley stripe, rye fusariosis, and loose smut of oats [*Ustilago avenae*].

The best control of *U. avenae* was given by panogen (275 gm.), abavit-neu, and 15 minutes' immersion in mercuric chloride-formalin (0·1 per cent.), the first-named eliminating all but a trace of the smut. Ceresan U.T. 1875b (300 gm.) and liquid uspulun (one hour in a 0·25 per cent. solution) were also efficacious.

Stakman (E. C.), Popham (W. L.), & Cassell (R. C.). **Observations on stem rust epidemiology in Mexico.**—*Amer. J. Bot.*, xxvii, 2, pp. 90–99, 1 map, 1940.

Observations made during 1938–9 show that the uredinial stage of *Puccinia graminis* can persist throughout the year in southern Mexico, because wheat is grown there almost continuously all the year round. It is probable that the rust could be controlled to a considerable extent by eliminating the relatively small amount of summer wheat and prematurely sown fields of winter wheat. Races 38 and 59 have been by far the most prevalent in southern Mexico during at least the last decade. In fairly adequate surveys made from 1928 to 1931, inclusive, and in 1938–9, they comprised over 80 per cent. of all the isolates obtained, none of the other 14 races found being of importance. The exclusive importance of races 38 and 59 is further demonstrated by the fact that Marquis wheat, grown in parts of southern Mexico because of its resistance to these two races, did not suffer from rust for a number of years. In northern Mexico, according to race surveys from 1928 to 1939, inclusive, the high percentage of isolates yielded race 38, followed by 49 and 56. It is concluded that little interchange of rust has taken place between southern Mexico and the wheat-growing areas of north-eastern Mexico and the United States [*R.A.M.*, xix, p. 394] during the past ten years, since neither race 49 nor 56 has been found in southern Mexico during this time, despite the prevalence in northern Mexico and the United States of race 49 during the first half of the decade, and of race 56 during the second. There is evidence, based on study of the movement of spores in the air and subsequent distribution of physiologic races of the rust, that there is sometimes an interchange of *P. graminis* between the United States and northern Mexico; early-sown winter wheat in northern Mexico may become infected from uredospores blown from the United States in the autumn, while spores may be blown into the United States in the winter or early spring. There is also a definite tendency for the prevalence of certain races in northern Mexico and the United States to fluctuate together. The prevalence of race 38 both in southern and northern Mexico and in the United States does not necessarily indicate that there is an interchange between the three regions. It may be explained by the fact that this race is well suited for overwintering and is also commonly isolated from rusted barberries in the Ohio Valley and eastern United States. The uredinial stage of *P. graminis* appears to persist throughout the year, at least to some extent, in certain mountain valleys of northern Mexico, but the importance of this survival has not yet been determined. The role of numerous native barberries is not yet known.

Hassebrauk (K.). **Zur Frage der Wirkung von Aussenfaktoren auf verschiedene Stadien von Weizenbraunrostinfektionen.** [On the question of the effect of external factors on various stages of Wheat brown rust infections.]—*Phytopath. Z.*, xii, 5, pp. 490–507, 1940.

A tabulated account is given of the writer's further investigations (not yet completed) at the Gliesmarode (Brunswick) branch of the Biological Institute on the influence of external factors on different phases of brown rust of wheat (*Puccinia triticina*) [*R.A.M.*, xviii,

p. 731]. Generally speaking, the effect of darkness, a steam-saturated atmosphere, or a low temperature (4° C.) in the early stages of infection was to lower the resistance to infection of moderately, and in some cases even of highly, resistant varieties; exposure to these influences in the middle phases tends to retard the appearance of pustules but does not ordinarily modify the varietal reactions; at an advanced stage the treated plants mostly acquired enhanced resistance.

Hassebrauk (K.). **Abschliessende Untersuchungen über die feldmässige Verwendungsmöglichkeit von p-Toluolsulfonamid als innertherapeutisch wirkendes Getreiderostbekämpfungsmittel.** [Final investigations on the possibility of field utilization of p-toluolsulphonamide as an internal therapeutic for the control of cereal rusts.]—*Phytopath. Z.*, xii, 5, pp. 509–510, 1940.

Contrary to the expectations aroused by the successful results of greenhouse experiments, paratoluolsulphonamide (1 to 20 gm. per sq. m. of soil) [*R.A.M.*, xvii, p. 663] entirely failed to control yellow and brown rusts of Michigan and Carsten V wheat [*Puccinia glumarum* and *P. triticina*] in the field at Gliesmarode (Brunswick) and caused heavy damage to the plants.

Limber (D. P.). **Notes on the stinking smuts of Wheat from Afghanistan in 1939.**—*Plant Dis. Reptr*, xxiv, 6, p. 136, 1940. [Mimeographed.]

Of 53 samples of wheat recently examined from 11 localities in Afghanistan 18 bore bunt balls of *Tilletia levis* [*T. foetens*] and one those of *T. tritici* [*T. caries*]. The relative prevalence of the two species is thus very similar to that obtaining in Turkey, where *T. foetens* also predominates.

Lange-de la Camp (Maria). **Blüteninfektionen mit Myzel von Ustilago tritici.** [Blossom infections with mycelium of *Ustilago tritici*.]—*Z. PflKrankh.*, l, 3–4, pp. 142–180, 2 figs., 1940.

After much difficulty the writer succeeded in obtaining inoculum of *Ustilago tritici* for experimental purposes by mixing freshly growing hyphae of opposite sex from subcultures and preparing suspensions from the resultant mycelium [*R.A.M.*, xvi, p. 240]. Although certain combinations were more virulent than others in tests on the Grüne Dame, Peragis, and Hohenheimer 25 f wheat varieties, infected through the stigma under very humid conditions, such differences cannot with certainty, pending extended analyses of haplont combinations of the progeny, be ascribed to genetic factors. A number of plants inoculated with mycelial combinations in which line 13/5d was a partner showed an abnormal type of infection characterized by the confinement of malformation and spore production to the lower half of the ear.

Winter (G.). **Untersuchungen über den Einfluss biotischer Faktoren auf die Infektion des Weizens durch Ophiobolus graminis.** [Investigations on the influence of biotic factors on the infection of Wheat by *Ophiobolus graminis*.]—*Z. PflKrankh.*, l, 3–4, pp. 113–134, 1940.

Continuing his studies at the Bonn Phytopathological Institute on

the relation of edaphic factors to the infection of wheat by *Ophiobolus graminis* [*R.A.M.*, xix, p. 269], the writer found that, contrary to Garrett's assumption, the accumulation of carbon dioxide in the soil (loose compost and loess of 40 per cent. moisture-holding capacity in these experiments) is not a limiting factor in the development of the 'runner' hyphae [ibid., xvii, p. 230]. This result would appear automatically to dispose of Garrett's corollary regarding the superior development of the fungus after partial sterilization of the soil [ibid., xiii, p. 433] involving a temporary decrease in the carbon dioxide content of the atmosphere. However, in the very damp, dense clay soils with which Garrett apparently worked, it is possible that the stimulus afforded to the growth of the pathogen by sterilization might be correlated to some extent with a modification in the partial pressure of carbon dioxide.

Aqueous extracts of compost soil in strong concentrations, treated for 30 minutes in the autoclave, stimulated the development of 'runners' in quartz sand, an effect presumed to be due to the destruction by heat of microbial substances in the soil solution which are normally toxic to *O. graminis*. It must be remembered, however, that heating of the soil, like any other form of partial sterilization, brings about changes in other factors, such as the nutrient content, and its influence on the development of a given pathogen is only one aspect of a complex microbiological phenomenon.

Adam (D. B.). **On the occurrence of Cercosporella herpotrichioides Fron in South Australia.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 48–51, 2 figs., 1940.

Cercosporella herpotrichoides (which the author considers should be spelt in the way originally proposed by Fron, i.e., as *C. herpotrichioides*) is here recorded for the first time on wheat, causing eyespot lodging [*R.A.M.*, xviii, p. 448], in South Australia. The disease occurred in experimental plots at the Waite Agricultural Research Institute where it was first suspected in November, 1937. There is no indication that infection has been recently introduced.

Padwick (G. W.). **A new disease of Wheat in India.**—*Curr. Sci.*, ix, 4, pp. 179–180, 1940.

In March, 1939, Pusa 12 wheat plants at Pusa developed a condition in which they became bleached and prematurely ripened, while the ears contained only shrivelled grains, the subcoronal internodes were shiny black, and the roots were black and decayed. Isolations from ten pieces of diseased tissue yielded seven cultures of *Fusarium* and one culture the mycelial characters of which resembled those of *Ophiobolus graminis*, but which produced no perithecia or spores. When Pusa 12 seed was sown in pots of previously sterilized maize meal-soil experimentally inoculated with the fungus, the plants that developed were withered, pale, and yellowish, and much smaller than the controls grown in uninoculated soil. The bases of the stems of the infected seedlings were flecked with black, and the roots were black and shiny and bore macrohyphae characteristic of *O. graminis*, though it is not possible to

determine the fungus precisely in the absence of perithecial formation. The disease is considered to be new to India.

COLQUHOUN (T. T.). **Effect of manganese on powdery mildew of Wheat.** —*J. Aust. Inst. agric. Sci.*, vi, 1, p. 54, 1940.

When manganese sulphate was applied at rates of 0, 16, 32, and 264 lb. per acre to Ranee 4H wheat plants grown in quartz sand in pots in a glasshouse in South Australia, each addition significantly reduced infection by *Erysiphe graminis* (which developed very freely) below that of the preceding smaller dressing, the disease ratings (from 0 for unaffected to 5 for severely affected plants) per mean of 60 plants for these treatments being, respectively, 3·37, 3·12, 2·83, and 1·45.

Bekæmpelse af Plantesygdomme. [Control of plant diseases.] *ex* **Oversigt over Resultaterne af Landboforeningens Forsøgsvirksomhed paa Sjælland 1939.** [Survey of the results of the Agricultural Association's work in Zealand in 1939.]—*Beretn. Planteavl, Sjælland, 1939*, pp. 311–340, 1940.

In experiments in Denmark, the incorporation of manganese sulphate with the soil at the rate of 30 kg. per hect. for the control of grey speck of wheat [*R.A.M.*, xviii, p. 88] increased the grain and straw yields by 620 and 640 kg. per hect., respectively, the corresponding figures for the 60 kg. dose being 640 and 700, respectively.

OLSEN (H. K.). **Forsøg og Undersøgelser vedrørende kemiske Midler til Bekæmpelse af Plantesygdomme og Ukrudt.** [Experiments and investigations relating to chemical means for the control of plant diseases and weeds.]—*Beretn. Planteavl, Sjælland, 1939*, pp. 220–229, 1940.

The following are some of the data presented in this statistical analysis, accompanied by explanatory notes, of the results of co-operative experiments in Denmark in 1939 in the control of cereal diseases by chemical treatments. The incidence of barley stripe [*Helminthosporium gramineum*] (average of 16 tests) was reduced from 2·9 to 0·1, 0·1, 0·1, 0·3, 0·1, 0·1, and 0·3 per cent., respectively, by dahmit (150 c.c. per 100 kg. seed-grain) [*R.A.M.*, xvii, p. 594], sanagran (75 gm.), dansk tillantin (75), betasan dust (75), tillantin [ceresan] 1875 dry (75), G.V. I dust (90), and G.V. II dust (100), the corresponding figures for the same preparations over the period 1930 to 1939 being 0·2, 0·1, 0·1, 0·2, 0·1, 0·1, and 0·3, respectively, as against 5·5 in the controls. Increased barley yields of up to 630, 580, and 450 kg. per hect. were secured by the use of dahmit, sanagran, and ceresan 1875, respectively, the corresponding figures for oats (treated against loose smut [*Ustilago avenae*]) being 210, 140, and 110 kg., respectively. Barley stripe was much the most serious of the diseases observed in the course of the 1939 field inspections, especially in Jutland.

REED (G. M.). **Physiologic races of Oat smuts.**—*Amer. J. Bot.*, xxvii, 3, pp. 135–143, 1940.

In studies conducted at the Brooklyn Botanic Garden, 58 collections of *Ustilago avenae* and *U. levis* [*U. kolleri*] from widely separated regions were tested on about 200 varieties and strains of nine species of oats.

Twenty-nine physiologic races of the former and 14 of the latter smut [cf. *R.A.M.*, xviii, p. 16] were separated on the basis of their behaviour on definite strains of 17 and 10 varieties of oats, respectively. Susceptible varieties gave 75 to 100 per cent. infection, while the resistant ones yielded no or only a few smutted plants. Some varieties consistently showed a variable percentage of infection. Thus, the percentage of infection in Red Rustproof ranged on the average from about 45 to 60, but in some cases rose to 100. Some races showed a high degree of specialization (race 11 of *U. avenae*, for instance, infected only one strain of *Avena barbata*), while others occurred on a wide range of strains or varieties. One or more strains of all nine species used were susceptible to at least one race of either smut. So far as tested, no species or variety of oats was susceptible to all the races. Canadian was susceptible to all races of *U. avenae* except 11, and to all of *U. kolleri* except 2; Monarch was suceptible to many races of *U. avenae* and to all of *U. kolleri* except 2 and 5. *A. barbata* was infected by 13 races of *U. avenae* and 2 of *U. kolleri*, but was not tested with the others. The Markton, Navarro, and Victoria varieties proved resistant to practically all races of both smuts.

Poos (F. W.). **Host plants harboring Aplanobacter stewarti without showing external symptoms after inoculation by Chaetocnema pulicaria.**—*J. econ. Ent.*, xxxii, 6, pp. 881–882, 1939.

In a series of tests at the Arlington Experiment Farm, Virginia, in 1938–9, typical symptoms of bacterial wilt (*Aplanobacter stewarti*) were produced in susceptible maize (sweet corn) by inoculation with juice expressed from the following plants upon which adults of *Chaetocnema pulicaria* had fed for several days [*R.A.M.*, xvii, p. 740]: Golden Cross and Gill Brothers' Golden Bantam field maize, *Digitaria* sp., *Panicum dichotomiflorum*, *P. capillare*, *Coix lacryma-jobi*, *Poa pratensis*, *Dactylis glomerata*, *Agrostis alba*, *Sorghum vulgare* var. *sudanense* [*S. sudanense*], wheat, and *Setaria lutescens*: of these only maize, *C. lacryma-jobi*, and *S. lutescens* have been reported as showing external symptoms of the disease. Further evidence that the pathogen overwinters in *Chaetocnema pulicaria* was obtained by the development of typical wilt symptoms in susceptible sweet corn plants into which was introduced inoculum from adults of the insect taken from emergence cages and placed on several different species of grasses in the field in February.

It is considered highly probable that the occurrence of symptomless hosts of *A. stewarti* in the field may play an important part in the spread of wilt through the agency of *C. pulicaria*.

Stevens (N. E.) & Haenseler (C. M.). **Sixth experimental forecast of the incidence of bacterial wilt on Sweet Corn.**—*Plant Dis. Reptr*, xxiv, 6, pp. 122–129, 1 graph, 1 map, 1940. [Mimeographed.]

Over most of the area under observation the winter of 1939–40 was the coldest in the United States since 1936, and an application of the available meteorological data to the annual experimental predictions of the anticipated incidence of bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) on maize [*R.A.M.*, xviii, p. 588] indicates that commercially significant losses are not to be generally expected along the

eastern seaboard north of Maryland and central New Jersey. In Ohio and Indiana losses are not to be expected on sweet corn, unless the prevalence of the disease in field maize results in an exceptionally high carry-over of the pathogen.

Lincoln (R. E.). **Bacterial wilt resistance and genetic host-parasite interactions in Maize.**—*J. agric. Res.*, lx, 4, pp. 217–239, 2 figs., 3 graphs, 1940.

In this full account of his studies on *Phytomonas* (*Aplanobacter*) *stewarti* [*R.A.M.*, xviii, p. 516; and cf. xix, p. 209] on maize, the author states that loss in virulence on passage through susceptible lines of maize was always associated with a raised, firm type of colony on nutrient dextrose agars but not always with a change from the smooth to the rough phase; increase in virulence on passage through a resistant lines was associated with a more spreading, watery, and viscid growth, and changes in the growth from rough to smooth and from smooth to rough were observed during passage. Virulence of passage cultures was again changed by reversing the hosts through which they passed. From his experiments with single-cell isolations from an old stock culture, which was found to comprise many variants differing in virulence, the author concludes that the virulence of a culture is determined by the proportion of virulent and avirulent types present in the culture. Single-cell cultures consistently decreased in virulence after passage through a susceptible host, but retained their virulence almost unchanged after passage through a resistant host. When mixed inoculum of virulent and avirulent bacteria was used, there was a differential selection for the avirulent type in the susceptible host and for the virulent type in the resistant one in all 14 lines and 2 crosses of maize used, with one exception only. Both direction and rate of change were dependent upon host resistance and bacterial virulence. The mutation rate of colony colour and morphology of three bacterial strains after 18 hours' growth in nutrient broth, ranged from 1 in 20,000 to 1 in 800,000 individual cells, thus being of the same order as the known mutation rate of the genus in higher forms. The virulence of the mutations varied greatly, in either direction, from that of the parent stock. Sexual fusion of white and yellow strains of the organism in the living host could not be demonstrated experimentally.

Scossiroli (G. O. R.). **Ustilago maydis e autarchia.** [*Ustilago maydis* and autarchy.]—*Riv. ital. Essenze*, xxii, 3, pp. 82–86, 8 figs., 1940.

Suggestions are made for the artificial propagation, under proper safeguards to avoid widespread epidemics, of maize smut (*Ustilago maydis*) [*U. zeae*] for medicinal purposes [*R.A.M.*, xv, p. 223 *et passim*] as an adjunct to *Claviceps purpurea* in Italy [ibid., xix, p. 95].

Edwards (E. T.). **Internal grain infection and kernel rot in the 1938 American Maize crop.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 25–31, 1940.

During the 1938 survey of the relative prevalence and distribution of fungi causing kernel rot of maize in the United States [*R.A.M.*, xviii, p. 669], which was based on examination of the damaged kernels, the

author made a study of the sound grain samples with a view to investigating the nature and prevalence of internal grain infection over the wide area concerned, and obtaining definite information as to the regional relationships of the two types of infection. From each sound sample 50 grains were used, any grain that showed external evidence of rotting or injury being discarded.

The results showed that the relative frequency of *Diplodia zeae* as an internal seed-borne organism in Illinois, Indiana, Ohio, Delaware, and Maryland was 7·1, 7·2, 2, 5·5, and 5 per cent., respectively, compared with total infection of 69·8, 64·5, 51·1, 46·9, and 40 per cent., respectively. It was not recorded at all from Kansas, Nebraska, and Colorado.

Gibberella zeae [*G. saubinetii*: ibid., xix, p. 117] caused the maximum internal infection (16·7, 13·0, and 6·0 per cent., respectively), in Maryland, Delaware, and Ohio, and was absent from Missouri, Nebraska, Kansas, Colorado, and Tennessee.

G. fujikuroi was the only fungus occurring as an internal seed-borne organism in all States. The degree of internal infection ranged from 57·1 per cent. in Nebraska to 4·7 per cent. in Ohio and it was the most prevalent internal organism in all areas except Ohio, Indiana, and Illinois. *G. fujikuroi* var. *subglutinans* was isolated on a number of occasions from apparently sound maize grown at Madison, Wisconsin.

Nigrospora sphaerica was unimportant as a cause of kernel rot, but was considerably more prevalent as an internal seed-borne organism, occurring in six States in this manner only. It was the most prevalent internal organism in Ohio (27·3 per cent.), and its incidence in Minnesota, Illinois, and Indiana was 13·9, 11·2, and 8·2 per cent., respectively.

Cephalosporium acremonium was seldom associated with kernel rot, but occurred as an internal seed-borne organism in all States, and was most prevalent in Tennessee, Kansas, Missouri, and Iowa, where its incidence was 26·7, 25·6, 25·1, and 20·6 per cent., respectively.

Species of *Penicillium* were relatively prevalent only in Minnesota and Indiana, the figures for internal infection being 9·4 and 5 per cent., respectively.

In Minnesota, Ohio, Maryland, Delaware, and Iowa miscellaneous fungi were an important factor in the causation of kernel rot, and were also common as internal, seed-borne organisms, the incidence of this type of infection in these States being 14·2, 10, 14·8, 12, and 10 per cent., respectively. These miscellaneous fungi consisted principally of *Rhizopus* spp., *Chaetomium* sp., *Trichoderma* sp., *Aspergillus* spp., *A. niger*, *Cephalothecium* [*Trichothecium*] *roseum*, and some unidentified organisms.

The organisms invading maize ears fall into two distinct types. In general, *D. zeae* and *G. zeae* are vigorously pathogenic, and infection by these is usually followed by marked rotting of the tissues, while organisms such as *G. fujikuroi* and its var. *subglutinans*, *N. sphaerica*, and *Cephalosporium acremonium* are not actively pathogenic, and may not produce any recognizable symptoms.

The evidence obtained showed that in the States where *G. fujikuroi* was most prevalent as a cause of kernel rot it was also the commonest internal seed-borne organism. Where *D. zeae* was the most prevalent cause of kernel rot, on the other hand, it was relatively unimportant

as an internal seed-borne organism. Often, *D. zeae* was very prevalent as the cause of kernel rot, while the corresponding samples from the same States of sound grain showed heavy internal infection by *G. fujikuroi*. *G. saubinetii* was rarely found in ears not showing obvious infection. With *C. acremonium* and *N. sphaerica* there was no correlation between kernel rot and internal grain infection. The pathogenicity of the former is doubtful, and though it occurred rather commonly as an internal organism, it was seldom associated with kernel rot. *N. sphaerica* does not usually cause kernel rot, but occasionally invades the ears, and generally causes severe rotting of the cob. Internal infection by *N. sphaerica* probably results from cob invasion, frequently where no grain rot occurs.

Miller (E. V.), Winston (J. R.), & Fisher (D. F.). **Production of epinasty by emanations from normal and decaying Citrus fruits and from Penicillium digitatum.**—*J. agric. Res.*, lx, 4, pp. 269–277, 4 figs., 1940.

It is stated that tissues of a considerable number of plants are known to evolve a gaseous substance, very probably ethylene, causing epinasty in test plants. In the present study fruits of orange, tangerine, grapefruit, lemon, and lime were stacked round potted test plants (potato, tomato, and sunflower) on a wire platform in a wide-mouthed jar. Potassium hydroxide pellets were placed under the wire platform to absorb the carbon dioxide produced by the fruit. Epinasty of the leaves of the test plants was induced by all the citrus fruits used. Grapefruit and oranges inoculated with *Penicillium digitatum* and oranges showing stem-end rot (*Diplodia natalensis* and *Diaporthe citri*) induced epinasty more quickly than did sound fruit. Epinasty was also induced by pure cultures of *P. digitatum*, but the results obtained with those of the stem-end rots and *Alternaria citri* were either negative or inconclusive.

Mayne (W. W.). **Coffee spraying.**—*Plant. Chron.*, xxxv, 9, p. 175, 1940.

As the blossom showers had not fallen in southern India by 12th April, it is suggested that spraying against coffee leaf disease (*Hemileia* [*vastatrix*: ***R.A.M.***, xix, p. 403]) can be postponed in areas where a great deal of old leaf has been lost until after the heaviest rains of the south-west monsoon, i.e., until August. Areas with a heavy head of leaf and about to bear heavily should be sprayed before the south-west monsoon.

Greathouse (G. A.) & Rigler (N. E.). **The chemistry of resistance of plants to Phymatotrichum root rot. IV. Toxicity of phenolic and related compounds.**—*Amer. J. Bot.*, xxvii, 2, pp. 99–108, 1940.

In further studies on the nature of resistance of plants to *Phymatotrichum omnivorum* [*R.A.M.*, xviii, p. 24; xix, p. 147] the authors tested a total of 45 phenolic and related compounds upon pure cultures of the fungus. When only one group was attached to benzene the order of toxicity was phenol > thiophenol > benzoic acid > benzaldehyde > anisole. When two groups were attached, the toxicity was conditioned not only by the nature of the two groups but also by their positions round the benzene ring: for the dihydroxybenzenes, the order of position toward toxicity was para > ortho > meta; for the dihydroxybenzoic

acids, para = ortho > meta; for the methylphenols and the methylbenzoic acids, para > meta > ortho; and for the aminophenols, ortho > para = meta. Introduction of a second group into phenol or thiophenol decreased the effectiveness, while combination of a second group with benzoic acid or anisole increased it. Methylation of phenols decreased toxicity except where the two hydroxyls were in the meta position to each other. The addition of a basic amino group in the ortho position to hydroxyl enormously increased toxicity, while the same group in the meta or para position decreased it. When the hydroxyl group was methylated, as in the anisidines, the potency of the ortho compound was greatly diminished while that of the other two isomers was increased. The effect of addition of a carboxyl group varied with the potency of the group already present: the toxicity was decreased when it was a potent group, such as hydroxyl, and greatly enhanced when it was a weak group, such as methoxyl. When more than one group was present, there seemed to be little difference in toxicity between the aldehyde and the carboxyl groups. The substitution of sulphur for oxygen to form thiophenols resulted in a decrease of potency. With an increase in the number of groups attached to benzene, it became more difficult to determine the part played by each; the activity increased when alkyl groups were added, and it was usually lessened when a number of hydroxyl groups were present. Pyrogallol, however, was very toxic in contrast to its isomer, phloroglucinol. Isomerism was observed to play an important part in all types of compounds.

Leach (J. G.), Hodson (A. C.), Chilton (St. J. P.), & Christensen (C. M.). **Observations on two ambrosia beetles and their associated fungi.**—*Phytopathology*, xxx, 3, pp. 227–236, 4 figs., 1940.

A full account is given of the writers' studies from 1934 to 1936 on the life-histories of two species of 'ambrosia' beetles occurring in great abundance on dying aspen and paper birch (*Betula papyrifera*) in Itasca Park, Minnesota, viz., *Trypodendron retusum* and *T. betulae*, respectively, and their associated fungi, the latter being investigated in pure culture on potato dextrose agar as well as in nature.

The two fungi isolated are considered to be very closely related strains of one species which clearly differs from Trotter's *Ambrosiaemyces zeylanicus* [*R.A.M.*, xiv, p. 167], but is probably related to *Monilia candida*, originally described by Hartig in association with *Xyleborus dispar* (*Allg. Forst- u. Jagdztg*, xiii, pp. 73–75, 1844). The same name was applied by Castellani to a human pathogen of totally different characteristics and this fungus was renamed *Candida* [*vulgaris*] by Miss Berkhout [*R.A.M.*, iii, p. 555], who apparently overlooked Hartig's species. Pending further and more intensive studies, the ambrosia fungi connected with *T. retusum* and *T. betulae* should be regarded as strains of *M. candida* Hartig.

Krug (H. P.). **Una nova espécie de Hypocrella.** [A new species of *Hypocrella*.]—*J. Agron., S. Paulo*, iii, 1, pp. 69–82, 12 figs. (1 col.), 1940. [English summary.]

Portuguese and Latin diagnoses are given of *Hypocrella fluminensis* n.sp., found parasitizing an Aleyrodid on the foliage of wild canes in

the State of Rio de Janeiro, Brazil, and differing from the related *H. turbinata* [*R.A.M.*, xv, p. 579] in a number of important particulars.

DUDDINGTON (C. L.). **Predaceous Phycomycetes from Cotswold leaf-mould.**—*Nature, Lond.*, cxlv, 3665, pp. 150–151, 1940.

The writer has isolated in pure culture from leaf mould from wooded areas in the Cotswolds four species of Zoopagaceae corresponding with those described from the United States by Drechsler as *Cochlonema verrucosum*, *C. dolichosporium*, *Stylopage haploe*, and *S. hadra* [*R.A.M.*, xiv, p. 508; cf. also xviii, p. 798]. The three first-named are parasitic on amoebae while *S. hadra* preys on nematodes.

SMITH (R. I.). **Studies on two strains of Aphanomyces laevis found occurring as wound parasites on Crayfish.**—*Mycologia*, xxxii, 2, pp. 205–213, 1 fig., 1940.

Two strains of *Aphanomyces levis*, designated A and B, acting as mild, facultative parasites, were isolated at Cambridge, Massachusetts, from young crayfish kept in the laboratory. The two strains showed certain physiological differences: on maize meal agar, A showed a sparse, and B a very dense aerial growth; A formed oogonia rapidly and in great numbers, but scarcely ever produced zoospores, whereas B formed oogonia only very rarely, but produced many zoospores. In reviewing the literature on *A. levis*, the author points out that the obvious disagreement existing among the several physiological descriptions of this species may well be a reflection of its great variability in nature, which is strikingly shown in the reproductive habits of the two strains described in this paper.

THORNER (JULIET E.). **Erythema nodosum in childhood associated with infection by the Oidium coccidioides. Report of seven cases.** – *Arch. Pediat.*, lvi, 10, pp. 628–638, 3 figs., 1939.

Clinical details are given of seven benign cases of erythema nodosum (*Coccidioides immitis*) in children aged from 3½ to 13 years in California [*R.A.M.*, xix, p. 218], the identity of the fungus being established by culture on Sabouraud's medium and recovery from guinea-pigs after inoculation.

GUNTER (W. A.) & LAFFERTY (C.). **Histoplasmosis of Darling : report of case.**—*J. med. Ass. Ala*, ix, 10, pp. 337–339, 2 figs., 1940.

The fungus isolated from tissues of the internal organs in a fatal case of histoplasmosis (the ninth in the medical literature and the first in Alabama) in a 54-year-old woman was identified by W. A. De Monbreun as *Histoplasma capsulatum* [*R.A.M.*, xviii, p. 456].

LANGERON (M.) & GUERRA (P.). **Orientation de la filamentisation des champignons levuriformes cultivés sur lames gélosées.** [The orientation of hyphal formation in yeast-like fungi cultured on agar slides.] —*Ann. Parasit. hum. comp.*, xvii (*1939–40*), 6, pp. 580–589, 30 figs., 1940.

In the course of culturing yeast-like fungi in multiple streaks on agar-coated slides the writers have observed that the streaks, when situated

in unduly close proximity, exert two reciprocal effects which determine the orientation of hyphal formation, viz., firstly, a preventive action restricting or even completely inhibiting the production of hyphae in the zone separating one streak from another; and, secondly, a contrary action which permits normal hyphal formation to take place on the other side of the streak. It is concluded that the preventive influence is an expression of activity on the part of the living cells, independent of the identity of the fungus concerned (in these experiments *Candida tropicalis* [*R.A.M.*, xix, p. 278] was grown in association with *C. albicans*, *C. parakrusei*, *Rhodotorula mucilaginosa*, *Hormodendrum* sp., and *Trichosporon* sp.), and resulting from modifications in the medium produced either by the diffusion of inhibitory substances arising from the surface of the streak, from the withdrawal of essential nutrients, or from a combination of these two factors.

Reeves (R. J.). **The roentgenologic significance of bronchomycosis. Case reports.**—*Sth. med. J.* (*J. sth. med. Ass.*), xxxiii, 4, pp. 361–366, 9 figs., 1940.

Clinical details are given of six cases of pulmonary mycosis at the Duke Hospital, North Carolina, in which the application of X-rays to the bronchi assisted in diagnostic procedure [*R.A.M.*, xix, p. 217]. *Candida albicans* was among the fungi isolated from the sputum.

Bigg (E. M.) & Sheldon (J. M.). **Air borne fungus spore counts of Ann Arbor, Michigan.**—*Univ. Hosp. Bull., Ann Arbor, Mich.*, v, 6, p. 43, 1 graph, 1939.

For the first time in south-eastern Michigan, in connexion with the clinical study of respiratory allergy, counts of air-borne fungus spores were initiated at Ann Arbor in February, 1938, when dextrose-tartaric acid plates were exposed to the air for 15 minutes every three days until the following September [cf. *R.A.M.*, xviii, p. 799]. The following organisms predominated: *Alternaria*, *Hormodendrum*, and *Penicillium* spp. and yeasts, peaks being reached in the early spring and autumn.

Tesauro (S.). **Considerazioni cliniche su di un caso non comune di microbide da Trichophyton gypseum asteroides.** [Clinical aspects of an uncommon case of microbid due to *Trichophyton gypseum asteroides*.]—*Gazz. Osp. Clin.*, xl, 32, pp. 756–758, 761, 1939.

This is a detailed account and critical discussion of an unusual case of annular infection of the left hand, followed by secondary extension to the right hand and soles of the feet, due to *Trichophyton gypseum asteroides* [*T. mentagrophytes*] in a doctor treated at the Pavia Dermatological Hospital.

Tolmach (J. A.) & Schweig (J.). **Generalized Trichophyton purpureum infection simulating dermatitis herpetiformis : report of a case.**—*Arch. Derm. Syph., Chicago*, xli, 4, pp. 732–735, 2 figs., 1940.

Full clinical details are given of a case of generalized and atypical infection by *Trichophyton purpureum* [*R.A.M.*, xvii, p. 679] in a 38-year-old Hungarian in New York.

Göhring (G.). **Beiträge zur Kultur des Mikrosporon furfur.** [Contributions to the culture of *Microsporon furfur*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxlv, 6, pp. 322–328, 4 figs., 1940.

Like other workers with *Microsporon* [*Malassezia*] *furfur*, the writer experienced great difficulty in obtaining the fungus in pure culture [*R.A.M.*, xix, p. 346], but succeeded in doing so on Grütz's malt-peptone agar with scales from a 20-year-old girl suffering from pityriasis versicolor at Nürnberg. The radially furcate colonies resembled those described by Marquardt [ibid., xvi, p. 456] except in their rather more pronounced purple tinge. The organism proved to be pathogenic to guinea-pigs.

Marchi (C.). **Setticemia consecutiva a tigna favosa.** [Septicaemia as a sequel to favous ringworm.]—*G. ital. Derm. Sif.*, lxxx, 4, pp. 726–737, 5 figs., 1939.

Achorion schoenleini was isolated from the blood-stream as well as from the hair of a ten-year-old Sardinian boy who contracted generalized septicaemia as a sequel to favus of the scalp [*R.A.M.*, xix, p. 216].

Lammerts (W. E.). **Ethyl mercury iodide—an effective fungicide and nemacide.**—*Phytopathology*, xxx, 4, pp. 334–338, 2 figs., 1940.

Excellent control of both pre- and post-emergence damping-off [? *Pythium de Baryanum* and *Corticium solani*] is stated to have been obtained in the writer's experiments in California by the application to the soil of boxes planted with stocks [*Matthiola incana*], *Phlox drummondii*, White Perfection *Viola cornuta*, and asters [*Callistephus chinensis*] of Du Bay 1155–HH (Bayer-Semesan Co., Inc.), containing 5 per cent. ethylmercury iodide, at the rate of 1½ gm. per sq. ft. From 5 to 14 times more seedlings emerged and survived in the treated boxes than in the controls and subsequent growth was altogether more vigorous in the former than in the latter.

Gadd (C. H.) & Loos (C. A.). **Lily mosaic.**—*Trop. Agriculturist*, xciv, 3, pp. 160–167, 7 figs., 1940.

Several Easter lily plants in a private garden in Ceylon were affected by a mosaic disease [cf. *R.A.M.*, xix, p. 411]. The lower leaves of the diseased plants were normal, but the upper were somewhat paler with numerous light green or yellowish, broad streaks or spots, usually about 5 mm. long but sometimes up to 6 cm., which tended to coalesce into irregular blotches. As the leaves expanded they became markedly curled. Later the chlorotic areas became white and desiccated in the middle and soon turned rusty and died. With one exception, the flowers opened normally, with only a slight distortion. The disease was readily transmitted to healthy lily plants by a green aphid [unidentified], and also to cucumber, tomato, and turnip, but in these plants the virus did not become systemic. The symptoms caused did not correspond precisely with those described for *Cucumis* virus 1 and it is suggested that the Ceylon virus may be a variant of this virus. The removal and destruction of infected plants as soon as the symptoms are observed is recommended.

Mulford (F. L.) & Weiss (F.). **Culture and diseases of Delphiniums.**—*Fmrs' Bull. U.S. Dep. Agric.* 1827, 12 pp., 3 figs., 1 map, 1939. [Received May, 1940.]

In this semi-popular pamphlet on the cultivation of annual and perennial *Delphinium* spp., it is stated that failures more often result from unfavourable cultural conditions than from parasitic organisms. Probably the most prevalent disease, especially of the perennials, is root rot, a symptom complex which includes death and decay of the roots and the basal part of the stem, sometimes followed by a loss or change of colour, wilting, or a general blight of the aerial parts of the plant. Cultural defects greatly promote the development of root rot, the most common being too warm an exposure, resulting in excessively high soil temperature, deficient soil moisture, and a tendency in clay soils to become crusty and compact, and a heavy type of soil that is not worked deeply enough. Contact of the crowns with stable manure may also induce root rot. If the cultural requirements of the species are not satisfied, root rot may develop even in absence of aggressive fungous parasites, but, on the other hand, plants grown under relatively ideal conditions may be attacked by certain parasites. The most common in the eastern States south of Pennsylvania is *Sclerotium rolfsii*, the form known as *S. delphinii* [*R.A.M.*, xiv, p. 147] occurring in then orthern part of this region. *S. rolfsii* causes sudden dying of one or more shoots and the decay of the crown and roots of both annual and perennial sorts. The fungus can persist in the soil for an indefinite period on live or dead vegetable matter. Soil disinfection with formalin, naphthalene flakes (8 oz. per sq. yd. dug well into the soil), or mercurous chloride (1 oz. per sq. yd.) is recommended. *Rhizoctonia* can also cause root rot, but may ordinarily be avoided by providing favourable cultural conditions. Other diseases mentioned are several bacterial troubles including leaf spot caused by *Bacterium delphinii* [ibid., xvii, p. 823]; mildew (*Erysiphe polygoni*) [ibid., xvi, p. 320]; a blight of annual species only (*Diaporthe arctii*) [ibid., x, p. 385]; virus diseases including stunt [ibid., xiii, p. 638] and those belonging to the group of cucumber mosaic viruses [ibid., xii, p. 473]; and damping-off of seedlings, against which treatment of soil with some formaldehyde dust prior to sowing is recommended.

Trent (J. A.). **The status of Cylindrosporium chrysanthemi E. and D., as the causative agent of Chrysanthemum leaf blight.**—*Trans. Kans. Acad. Sci.*, xlii, pp. 203–204, 5 figs., 1939.

The examination of fixed and stained specimens of *Chrysanthemum* leaf blight from various parts of the United States and Ontario revealed subepidermal pycnidia, 85 to 175 μ in diameter, some provided with a short beak and having ostioles through which escape the straight or slightly curved, fusiform, granular, obscurely septate conidia, 30 to 70 by 1 to 2·5 μ. These dimensions agree with those reported by Ellis and Dearness for the acervuli of *Cylindrosporium chrysanthemi* [*R.A.M.*, xi, p. 224], but differ markedly in respect of conidial measurements. It is concluded that the fungus in question has closer affinities with *Septoria* than with *Cylindrosporium*, and that *C. chrysanthemi* should be regarded as a synonym of *S. chrysanthemi* Cav. (*S. chrysanthemella*

Cav. [Sacc.]) [ibid., xvii, pp. 460, 654] or *S. chrysanthemi* Allesch. [ibid., xvi, p. 797].

Schmidt (E.). **Mehltau an Gloxinien.** [Gloxinia mildew.]—*Blumen- u. PflBau ver. Gartenwelt*, xliv, 11, p. 94, 1940.

Downy mildew (*Phytophthora speciosa*) is stated to be responsible for severe and widespread damage to gloxinias [*R.A.M.*, xiv, p. 637] in Switzerland, causing a brown discoloration and softening of the stem, which later extends to the petioles and pedicels; the leaves and buds droop and the plant soon dies. Soil sterilization by means of steaming or with a disinfectant such as uspulun, carbon disulphide, or formalin is the best control measure, supplemented by strict attention to sanitation and the avoidance of an unbalanced nitrogenous fertilizer.

Pirone (P. P.). **Leaf crinkle of Geranium.**—*Plant Dis. Reptr*, xxiv, 6, pp. 129–131, 1940. [Mimeographed.]

Over 400 geraniums [*Pelargonium*], mostly of the Olympic Red variety, were found in one New Jersey greenhouse in 1938 to be affected by crinkle [*R.A.M.*, xviii, p. 442]. Observations in the same year on varietal reaction to the disease denoted comparative resistance in Improved Ricard and Poitevine and immunity in the white types. In 1940 Salmon Supreme was also found to be very susceptible, while Appleblossom and White Buchner showed a high degree of resistance. Thrips were suspected of transmitting the virus from the recently introduced Salmon Supreme to Olympic Red, which, as in 1938, was again heavily infected. In addition to insects, diseased cuttings serve as a source of perpetuation of crinkle, the great difficulty in the control of which lies in the complete masking of the symptoms, simulating recovery, during the summer months. Cuttings taken from masked plants in the early winter do not develop the typical symptoms of the disease until they are six to eight weeks old.

Ray (W. W.). **A new Cercospora from Oklahoma.**—*Mycologia*, xxxii, 2, p. 271, 1940.

A description [with a Latin diagnosis] is given of a new species, *Cercospora laburni*, collected on leaves of *Laburnum anagyroides* [= *L. vulgare*] at Stillwater, Oklahoma. The fungus causes a serious leaf spot, the subcircular to angular lesions having a grey to white centre with a dark reddish-brown, narrow margin, and measuring 1 to 8 mm. in length. The stroma is slight to 50 μ in width; the conidiophores are dark in mass, pale olivaceous-brown singly, uniform in colour and width, sparsely septate, not branched, and measure 4 to 6 by 20 to 125 μ; and the conidia are hyaline, acicular, straight to slightly curved, with indistinct septa, truncate at the base, and measure 2 to 3·5 by 20 to 110 μ.

Clemente (G.). **Infezioni epidemiche di un' Alternaria tipo dianthi su semenzai di Garofano.** [Epidemic infections of an *Alternaria* of the *dianthi* type on Carnation seedlings.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 97–115, 1940.

In 1937 and 1938 valuable carnation seedlings in a nursery at San Remo became affected by a condition in which the hypocotyl turned

brown and became girdled, causing the collapse and death of the seedlings within 4 to 8 days. The affected material showed the presence of a fungus resembling *Alternaria dianthi*, but with ochraceous conidiophores. The ochraceous conidia had a well-developed foot [beak], measured 20 to 184 by 8 to 20 μ, and had 1 to 12 transverse septa; very occasionally a single longitudinal septum and one or two oblique septa were noted [cf. *R.A.M.*, xix, 349].

Inoculation of seedlings of carnation and *Dianthus barbatus* with mycelium or typical conidia from cultures resulted in 85 per cent. infection by mycelium and only a few plants infected by conidia. Seedlings from disinfected seed were then inoculated with conidia from plants experimentally infected with mycelium; the inoculated seedlings were kept for 24 hours in a saturated atmosphere and subsequently watered at regular intervals. After 22 days every inoculated plant of all carnation varieties tested was infected. Among the plants of *D. barbatus*, 20 per cent. of those inoculated with mycelium and 50 per cent. of those inoculated with conidia became infected in 22 days. No infection developed in any of the uninoculated controls.

The paper concludes with general recommendations for preventive treatment of the seedlings by cultural practices designed to increase resistance, frequent spraying with a mercury fungicide (0·1 to 0·2 per cent.), the removal of diseased plants, soil sterilization, and the disinfection of all appliances and containers with formalin.

NEILL (J. C.). **The endophyte of Rye-Grass (Lolium perenne).**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 280–291, 9 figs., 1940.

An account is given of the author's studies (forming part of a co-operative inquiry into a serious disease of livestock tentatively attributed to the ingestion of a herbage toxin) at the Plant Research Bureau, Department of Scientific and Industrial Research (New Zealand), on an endophytic fungus of perennial rye grass (*Lolium perenne*). In 1939 the organism was found to be present in 100 per cent. of the leaves of *L. perenne* (certified) plants of the current year's harvest, in 53 per cent. of those of 1938, in 23 per cent. of 'false' perennial (probably largely hybrid), and in none of the Italian rye grass [*L. italicum*] examined. In contrast to the figures for certified material, ordinary commercial rye grass in South Island was found to be partially or entirely free from the fungus. In an examination of plants raised from seed sown at varying ages, the incidence of infection in *L. perenne* decreased from 15 out of 15 at 3 to 4 months to 8 out of 15 at 1¼ years and to nil at 2¼ years and upwards: *L. multiflorum* from 3 to 4 months' old seed was free from the endophyte. The inspection of five hybrids between *L. perenne* and *L. multiflorum* revealed the presence of the endophyte as follows: 0 out of 10 in AB 2, 9 out of 10 in AB 3, 23 out of 28 in AB 4, 6 out of 6 in AB 5, and 6 out of 6 in AB 6. The interpretation of these data presents certain difficulties in the light of Miss Sampson's statement that infection is mechanically inherited from the female parent only [*R.A.M.*, xix, p. 224]; possibly some genetic factor for resistance may operate to produce the uninfected plants in some of the hybrids. In the case of AB 2 the endophyte was found to be present in the female but not in the male parent.

L. perenne plants free from the endophyte remained uninfected for at least two years in the open field. The fungus was not detected in a number of other common pasture grasses.

Within the foliar tissues, stained with lactic acid and aniline blue, the endophyte appears as a series of parallel hyphae, 1 to 2 μ in diameter (average 1·5 μ), with well-defined, non-staining, intercellular, sparsely branching hyphae, without haustoria, two adjacent hyphae sometimes being joined by a connecting filament with or without accessory structures. In the outer leaf sheaths the hyphae tend to become sinuous and folded. All the aerial parts of an infected plant appear to contain endophytic hyphae, which are, however, difficult to detect in very young tissues and in the chlorophyll-bearing leaf blades. In the mature seed the hyphae form a loose tangle in the crushed nucellar tissues overlying the aleurone layer, and a few can be traced in the embryonic tissues among the cells of the scutellum and base of the plumule, while a proliferation of interlacing hyphae forms an almost continuous layer upon the epithelium of the scutellum in contact with, but not penetrating, the adjacent endosperm cells.

Among the fungi isolated from surface-sterilized leaf tissues were *Colletotrichum gloeosporioides*, *C. graminicola*, and species of *Alternaria*, *Cladosporium*, and *Fusarium*. The endophyte itself was cultured on a number of standard media. Anaerobic conditions appear to be requisite for the primary growth of the endophyte outside the host. On potato dextrose agar the slowly growing colonies somewhat resemble the initial stages of sclerotium formation in a *Sclerotinia*. The fungus grew more vigorously on carrot and potato plugs than on the agar media. Cultures of identical appearance were secured by this method from over 90 per cent. of infected seedlings from three lines of certified perennial, whereas 70 endophyte-free seedlings of line 32–I yielded no growth.

Attempts to eliminate the fungus by a direct hot-water dip (10 minutes at 134° F.) gave negative results, but a reduction in the percentage of infection from 100 to from 0 to 80 in five certified lines of the 1939 harvest was obtained by pre-soaking for six hours at 55°, followed by 10 minutes at 128°.

Ludbrook (W. V.). **Occurrence of Sclerotinia minor Jagger on a bowling green.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 51–53, 1940.

The author records that a fungus agreeing in most respects with *Sclerotinia minor* [see below, p. 508] was observed at Canberra on a bowling green infested with water-weed (*Hydrocotyle* sp.), the foliage of which developed infection, especially when air and soil temperatures were about 60° to 75° F., and when heavy dews occurred. The individual patches were about 9 in. in diameter, but sometimes coalesced into areas of several square feet. The advancing edge was irregular and under humid conditions bounded by a greyish-white to buff zone about 1 cm. wide, formed by the aerial hyphae. To a distance of 1 cm. or more within this zone, the soil was covered by a slimy film made by the collapsed leaves and hyphae. Under favourable conditions, sclerotia formed as the film dried.

Temporary control resulted from treatment with mercuric chloride with and without mercurous chloride; applications must be made about

a week before an outbreak is expected, and be repeated at intervals of two or three weeks if conditions remain favourable to infection.

The optimum temperature for growth of the fungus on potato dextrose agar was 20° C. Sclerotia produced in culture were germinated by Dr. W. D. Waterhouse by placing them on wet cotton-wool in a Petri dish. The first sign of germination was observed after about three months and the first apothecium four months later. A comparison of the author's measurements of asci (means of 152·8 by 11·6 μ) and ascospores (14·26 by 7·79 μ) with those recorded by Keay for *S. minor* [*R.A.M.*, xviii, p. 628] showed good agreement. Hyaline, globose microconidia, 3 to 4 μ in diameter, developed on the surface of the upper quarter of the stalks of some of the apothecia, giving them a frosted appearance.

Miller (E. V.) & Schomer (H. A.). **A physiological study of soft scald in Jonathan Apples.**—*J. agric. Res.*, lx, 3, pp. 183–192, 1 graph, 1940.

In a study carried out in Virginia from 1933 to 1935, Jonathan apples were stored under conditions known to induce soft scald [*R.A.M.*, xiv, p. 41], e.g., at 32° and 36° F. either immediately or following a delay for 3 to 11 days at 65° to 75°, and subjected to heating or to carbon dioxide treatment following delay and prior to storage. Physiological analyses showed that fruit samples stored immediately exhibited a gradual but slight increase in acetaldehyde content, while a delay greatly increased the amount of this substance during the early part of the storage period, and treatment with carbon dioxide following the delay produced the highest acetaldehyde content of all samples. Further data are given on the sucrose and acid contents of similarly treated fruit. The authors failed to find, however, any correlation between the sugar, acid, and acetaldehyde contents and the occurrence of soft scald.

Kaess (G.). **Kältetechnische Zusatzverfahren für die Frischhaltung von Lebensmitteln und die Aussichten ihrer praktischen Anwendung.** [Improved refrigerative technique for the preservation of foodstuffs and the prospects of its practical application.]—*Naturwissenschaften*, xxviii, 7, pp. 103–109, 1 fig., 1 diag., 3 graphs, 1940.

This is a useful review of the present status of refrigerative technique for the preservation of foodstuffs against microbial infection by means of such recent improvements as storage in a carbon dioxide-containing atmosphere, the introduction of ozone [*R.A.M.*, xvii, p. 686] into storage rooms, treatment, e.g., of apples, with oil emulsions (of which 5 per cent. of the commercial preparation olea is stated to be effective [? against *Gloeosporium album*: ibid., xviii, p. 533] in Beauty of Boskoop and Baumann's Pippin), irradiation [ibid., xvii, p. 418], and the use of wrappers treated with chemical disinfectants.

Mittmann-Maier (Gertrud). **Untersuchungen über die Moniliaresistenz von Sauerkirschen.** [Studies on the resistance of sour cherries to *Monilia*.]—*Z. PflKrankh.*, l, 2, pp. 84–95, 1 fig., 1940.

In inoculation experiments at the Geisenheim (Rhine) Experiment Station in which conidial suspensions of *Monilia cinerea* [*Sclerotinia*

laxa] and *M.* [*S.*] *fructigena* from malt agar cultures were introduced through wounds into the branches of sour cherries, the most resistant varieties were Haarlem and Empress Eugénie (semi-sweet) and Grosser Gobet, the percentages of infection on which were 30, 27, and 33, respectively, as compared, e.g., with 95, 95, and 94 per cent., respectively, in Shade Morello, Ostheimer Weichsel, and Doppelte Natte [*R.A.M.*, xviii, p. 603]. Schmidt's observation to the effect that extensive gummosis is a concomitant of mild wilting and vice versa [see also loc. cit.] was confirmed by these experiments, the results of which indicated that a heavy flow of gum following branch infection is a supplementary diagnostic character of resistance to *Sclerotinia*.

The inoculations were carried out with a strain each of *S. laxa* from sour cherry, apricot, and peach, and with two of *S. fructigena* from apple. Regarding the nomenclature of *M. cinerea*, the writer takes cognizance of the decision of the British Mycological Society's Plant Pathology Committee, following T. H. Harrison, to adopt *S. laxa* for this species [ibid., xiv, p. 703], but prefers to retain *M. cinerea* for the German material pending a more intensive study of the taxonomy of the fungus in relation to environmental conditions. The strains of different origin showed corresponding divergences in culture. Thus, the sour cherry strain of *S. laxa* produced concentric zones of alternating light and dark coloration, the periphery and centre being invariably pale as was also the sparse aerial mycelium. The general aspect of the apricot strain of *S. laxa* was much lighter than the foregoing, the few dark areas being covered with a white or yellowish mycelium. Zones were formed in much the same manner as in the sour cherry strain. The relatively slow-growing peach strain of *S. laxa* was characterized by a few, narrow, concentric rings of pale yellow mycelium in the centre, surrounded by a darker zone with white rays, the periphery being pale and describing an almost perfect circle in contrast to the very sinuous margins of the other strains. Of the two strains of *S. fructigena*, that from Munich formed well-marked, pale yellow concentric zones, which were inconspicuous in the Pillnitz culture. The three strains of *S. laxa* were about equally pathogenic to cherry branches, the number killed ranging from 54 to 61 per cent. and those remaining externally sound but exuding gum from 10 to 12 per cent. *S. fructigena* was considerably weaker in its action, destroying only 26 to 35 per cent. of the infected branches and inducing gummosis in 25 to 34 per cent. Blossom infections gave positive results as follows: sour cherry, apricot, and peach strains of *S. laxa*, 58, 67, and 44 per cent., respectively; *S. fructigena* (Pillnitz) 35 per cent., and the same (Munich) nil.

Blodgett (E. C.). **A leaf spot of Italian Prune perpetuated in budded stock.**—*Phytopathology*, xxx, 4, pp. 347–348, 1 fig., 1940.

During the last few years the writer has observed a varying incidence of leaf spot and defoliation among Italian prunes in Idaho, the trouble being particularly severe in 1936. The lesions range from 1 or 2 mm. in diameter to large blotches and irregular necrotic areas, and may be accompanied by shot hole and indistinct mottling. Buds from diseased prune trees were set on healthy J. H. Hale and Elberta peaches in 1938

and the prune shoots developed severe leaf spot and chlorosis during the following summer. No parasitic fungus has been isolated from the diseased tissues, and the disturbance is tentatively attributed to a virus or genetic abnormality, though environmental factors (e.g., the vicinity of live stock) are believed to play an important part in its occurrence.

CHEAL (W. F.). **A difficult Strawberry problem in the Isle of Ely.**—*Gdnrs' Chron.*, cvii, 2775, pp. 107–108, 1 fig., 1 map (on p. 106), 1940.

In determining the rôle of yellow edge in the recent decline in strawberry production in the Isle of Ely, involving a reduction from 6 tons to barely 1 ton per acre, the author in 1937 obtained from the East Malling Research Station about 2,000 Royal Sovereigns virtually free from the disease [*R.A.M.*, xviii, p. 326], which were divided into four lots and planted in early winter as follows: (1) at Wisbech in good silt soil close to other strawberry fields; (2) at Little Downham on good, rather gravelly soil, about 300 yds. from other strawberry fields; (3) at Haddenham on moderately fertile greensand, about 440 yds. from other strawberry fields; and (4) at West Fen, March, on poor, dry, peaty soil, at least a mile in every direction from other strawberry fields. In lots (1) to (3) planting was carried out in squares, a yard apart, the runners being trained into the middle of the squares, while in (4) the plants were situated so far apart that there was scarcely any risk of interlocking runners. In the following September, after an exceptionally dry summer, the percentages of yellow edge in lots (1), (2), (3), and (4) were 41·5, 45·1, 26·9, and 0, respectively, though it should be mentioned that there were a number of suspicious but not authenticated cases of yellow edge in (4), together with extensive crinkle [loc. cit.].

It is apparent from these results that the planting of expensive, disease-free stocks of strawberries in established growing centres is an unwise procedure in the present stage of knowledge concerning the control of the insect vector. In these tests aphids, including *Capitophorus fragariae*, were abundant in all the lots except (4), attempts at their control being made only in (1). Apart from Royal Sovereign, all the other varieties cultivated locally either withstood the disease or carried it in a masked form.

ENDO (Y.). **Researches on Mulberry virosis.**—*Bull. Seric. Silk Industr., Uyeda*, xi, 4, pp. 203–218, 20 figs., 1939. [Abs. in *Biol. Abstr.*, xiv, 4, p. 704, 1940.]

Mulberry virosis is reported to be spreading in twelve prefectures in Japan [*R.A.M.*, xvii, p. 538] by means of grafting and the planting of diseased seedlings. Methylene blue is reduced by juice expressed from the leaves. The infective principle is stated to retain its virulence for nine years in desiccated foliage.

MAGEE (C. J. P.). **Transmission of infectious chlorosis or heart-rot of the Banana and its relationship to Cucumber mosaic.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 44–47, 2 figs., 1940.

In further studies on banana infectious chlorosis or heart rot in Australia [*R.A.M.*, xii, p. 201] transmission was obtained with *Macrosiphum*

gei, *Aphis gossypii*, and an unidentified aphid, and evidence was obtained that *Pentalonia nigronervosa* is only a capricious vector, unlikely to be important under natural conditions. Using *A. gossypii* as vector, the virus was transmitted from the Cavendish banana to *Musa ensete* and to a seeded *Musa* of undetermined species. From the last-named it was transmitted by *A. gossypii* to Cavendish and Gros Michel bananas, abacá (*M. textilis*), *Canna indica*, cucumber, squash, and tomato. It was readily transmitted by mechanical inoculation from cucumber and squash to cucumber, squash, and tobacco, and from tobacco to cucumber, squash, and the seeded *Musa*.

In tobacco, cucumber, and squash, the virus produces symptoms characteristic of *Cucumis* virus 1 [cucumber virus 1: ibid., xviii, p. 182]; the fern-leaf symptom develops when the virus is transmitted by *A. gossypii* to tomato. The author considers that the virus is, in fact, a strain of cucumber virus 1.

Collections made at random in different parts of New South Wales of cucumber, squash, tomato, and beet foliage, all showing mosaic symptoms, were tested by inoculation of young seedlings of the undetermined species of *Musa*, and in all cases symptoms identical with those produced by the virus of infectious chlorosis resulted.

Outbreaks are likely only in areas where vegetables are grown near bananas in the early stages of the establishment of a plantation. Cucumber virus 1 does not appear to be endemic in any part of New South Wales where bananas are grown. Common plantation weeds may become infected, and the following were found with mosaic-like symptoms in a plantation in which infectious chlorosis was spreading: *Solanum nigrum*, *S. verbascifolium*, *S. seaforthianum*, *Phytolacca octandra*, *Homalanthus populifolius* [*H. leschenaultianus*], *Passiflora alba*, *Physalis peruviana*, and *Bryanopsis laciniosa*. These weeds occurred in circumstances strongly suggesting the presence of a single virus, the identity of which was demonstrated in the case of the interplanted crop of Marglobe tomato plants showing fern-leaf mosaic.

If cucumber virus 1 and Wellman's celery virus 1 are to be regarded as identical, the symptoms described by Wellman on banana [ibid., xiv, p. 112] are those of infectious chlorosis. Abacá mosaic in the Philippines [ibid., xviii, p. 801] is also probably due to cucumber virus 1. That Cavendish banana plants affected with infectious chlorosis are susceptible to the bunchy top virus indicates that the two viruses belong to different immunological groups.

Carter (W.). **Populations of Thrips tabaci, with special reference to virus transmission.**—*J. Anim. Ecol.*, viii, 2, pp. 261–276, 1 pl., 4 graphs, 1939.

Observations in Hawaii showed that the percentage of *Emilia sonchifolia* plants attacked by yellow spot [tomato spotted wilt: *R.A.M.*, xviii, p. 657; xix, p. 355, above, p. 460, and next abstracts], was correlated closely with the percentage infested by *Thrips tabaci*, indicating that once the thrips is established on an *Emilia* plant it does not move readily from it. Data were also obtained that a considerable reservoir of virus may exist in the pineapple fields with little or no transference to pineapple plants taking place. Infestation of pineapple occurs during

blossoming and this transient stay is sufficient to infect the pineapple if the insect is viruliferous and the pineapple susceptible. There was no evidence of movement of *T. tabaci* from pineapple to pineapple or from undisturbed *E. sonchifolia* to pineapple. It is believed that, even in the presence of high populations of *T. tabaci* per unit of *Emilia*, the yellow spot disease can only assume economic proportions if factors governing dispersal of the thrips (possibly cultivation of the host plant areas or drought) are operating at the exact time when pineapple plants pass through their period of susceptibility.

SAKIMURA (K.). **Evidence for the identity of the yellow-spot virus with the spotted-wilt virus : experiments with the vector, Thrips tabaci.** —*Phytopathology*, xxx, 4, pp. 282–299, 4 figs., 1940.

Evidence is presented in support of the author's view that the Hawaiian pineapple yellow spot virus is identical with the tomato spotted wilt virus [see preceding abstract]. The virus, originally derived from *Emilia sonchifolia*, was transmitted by *Thrips tabaci* to, and recovered from, a large number of species of plants, all hosts of the spotted wilt virus. The inoculated plants developed symptoms identical with those of spotted wilt after incubation periods of similar duration. Beet, chard [*Beta vulgaris* var. *cicla*], cabbage [ibid., xvi, p. 502], and New Zealand spinach (*Tetragonia expansa*), previously reported to be immune from spotted wilt, likewise remained unaffected by the pineapple yellow spot virus in the writer's trials.

These data are considered to furnish convincing evidence of the identity of the spotted wilt and yellow spot viruses.

PARRIS (G. K.). **Mechanical transmission of yellow-spot virus : evidence for identity with spotted-wilt virus.**—*Phytopathology*, xxx, 4, pp. 299–312, 8 figs., 1940.

In 1937 tomatoes in Hawaii were observed to be suffering from a disorder closely resembling spotted wilt, except that bronzing was not a conspicuous symptom. The virus responsible for the condition does not appear to be seed-borne, but is readily transmitted by mechanical means from tomato to the same host and potato, and from *Emilia sonchifolia* to the same and tomato. Experiments in the mechanical transmission of the disease from tomato to *E. sonchifolia*, lettuce, garden peas, and bell pepper (*Capsicum annuum* [var. *grossum*]) gave negative results, but the virus was conveyed by grafting from tomato to the same host and potato and vice versa. The symptoms induced by artificial inoculation of tomatoes in the greenhouse are identical with those observed under natural conditions in the field, and further resemble those obtained by Linford by the introduction into tomatoes of the pineapple yellow spot virus with the aid of its insect vector, *Thrips tabaci*. Potatoes infected by the tomato virus develop symptoms corresponding exactly with those described by Magee as typical of spotted wilt in Australia [*R.A.M.*, xv, p. 538]. In the case of *E. sonchifolia* also the symptoms resembled those developing on field plants naturally infected by the pineapple yellow spot in Hawaii and (according to Whipple) by spotted wilt in Wisconsin [ibid., xvi, p. 134].

The Hawaiian tomato (yellow spot) virus is easily recoverable from

diseased fruits in an unripe condition but not at maturity, a characteristic observed by Samuel and collaborators in connexion with spotted wilt in Australia [ibid., x, p. 65].

Although the physical properties of the two viruses have not yet been compared, all the evidence at present available points to the identity of pineapple yellow spot and spotted wilt viruses [see preceding abstract].

Thomas (H. Earl), Rawlins (T. E.), & Parker (K. G.). **A transmissible leaf-casting yellows of Peach.**—*Phytopathology*, xxx, 4, pp. 322–328, 2 figs., 1940.

In 1932, a yellows of Early Crawford, Elberta, Fay Elberta, Muir, and Orange Cling peaches similar to, if not identical with, the 'X' disease of the north-eastern States [*R.A.M.*, xix, p. 292], was first observed in California, and since that date there is evidence of appreciable spread; in one orchard, for instance, where 37 out of 117 trees were affected in August, 1936, 49 had contracted the disease by mid-July, 1939.

In the Green Valley (Solano County) area, where most of the records have been taken, the only tangible early-season feature of the disorder is a slight delay in the flowering time of the diseased trees, but from late June onwards until the end of August more specific symptoms become apparent. Irregular areas of the leaf blade turn pale green to yellow and assume a brittle texture, soon separating from the rest of the leaf. The diseased leaves gradually develop a uniform greenish-yellow cast, rolling upwards, and being shed one by one, beginning with the oldest. Defoliation is accompanied by the shrivelling and dropping of the fruits.

The leaf-casting disease was first noticed in a block adjoining an orchard in which cherries were severely affected by buckskin [ibid., xiv, p. 111], and similar associations were subsequently observed in four localities in two counties. Inoculation of peach trees with cherry scions from buckskin-diseased trees resulted after considerable delay in the typical peach symptoms in 4 out of 7 and 8 out of 20 trees, whereas all the control trees remained healthy. Inconclusive results, however, were given by grafting from cherries to peaches and vice versa, so that the exact nature of the relationship remains obscure. Four out of seven trees of *Prunus demissa* inoculated with buckskin by grafting developed a conspicuous carmine coloration of the lower leaves suggestive of the reddening of the same host due to X disease. The number of infections resulting from grafting peach to peach has been consistently low. The Orange Cling seems to provide the most effective inoculum of the varieties tested, while shoots are in general more successful than roots for the purpose in view.

Richards (M. C.). **A soft rot of Apples caused by Trichoseptoria fructigena.**—*Phytopathology*, xxx, 4, pp. 328–334, 3 figs., 1940.

Trichoseptoria fructigena, originally recorded by Maublanc as attacking apple and quince fruits in France (*Bull. Soc. Myc. Fr.*, xxi, 95–97, 1905), was isolated on potato dextrose agar and by pouring dilution plates from two McIntosh apples collected by H. H. Whetzel at Cornell University, New York, this being apparently the first mention of the

fungus in North America. The fruits exhibited well-marked soft rot lesions of a vinaceous-fawn colour, glossy, and sunken, partially covered with black, slightly erumpent pycnidia.

In order to secure satisfactory growth in culture it was necessary to add dextrose at concentrations of 1, 2, or 5 per cent., which resulted in the development in ten days at room temperature (the optimum for growth being about 21° C.) of thick, black mycelial mats, composed of submerged hyphae which are dark green, later black, and grey aerial hyphae. The most abundant pycnidial production occurred at lower temperatures (up to 18°). In inoculation tests with mycelium inserted through notches on the fruits of 25 apple varieties the fungus induced on the red sorts a vinaceous-fawn discoloration and waxy consistency of the skin, while the yellow and green assumed ochraceous-buff and Dresden brown tints, respectively, accompanied by dullness of the skin. Erumpent pycnidia developed chiefly on the thick-skinned, moisture-retaining late autumn and winter varieties. In culture the erumpent pycnidia are covered with greyish hairs which are absent in nature. Infection of McIntosh in moist chambers at 15° was also secured by spraying the unwounded surfaces with conidial suspensions of *T. fructigena*. The disease was further communicated from rotted to sound apples by contact in storage.

The pycnidial and conidial dimensions of the New York collection agreed closely with those given by Maublanc, the conidia measuring 17 to 23·8 by 2·3 to 3·4 μ but the liberated spores were for the most part straight and pointed at the basal end, and non-septate (indistinctly biseptate in the French ones), and the conidiophores were much more complex than Maublanc's description or figures would suggest. These minor variations, however, are not considered to constitute an essential specific difference.

Martin (H.). **The scientific principles of plant protection with special reference to control. Third Edn.**—x+385 pp., London, E. Arnold & Co., 1940. 22*s*. 6*d*.

The incorporation in the third edition of this useful manual of a discussion of the many new developments in the science of plant protection during the last four years through the control of pests and diseases [*R.A.M.*, xv, p. 594] necessitated a drastic pruning of the text involving the re-setting of the book. Among the subjects in which the advance has been most evident are the nature and control of virus diseases, the epidemiological features determining the degree of severity of an attack, and the adaptation to practical requirements of judgements formed in the laboratory on the qualities contributing to insecticidal and fungicidal efficiency [ibid., xix, p. 420].

Bache-Wiig (Sara). **Contributions to the life history of a systemic fungous parasite, Cryptomycina pteridis.**—*Mycologia*, xxxii, 2, pp. 214–250, 27 figs., 1940.

A leaf roll disease of bracken caused by *Cryptomycina pteridis* and characterized by curling and stiffness of the pinnules of young fronds, yellowish-green discoloration, and the formation of brown spots and abundant black stromatic areas on the lower surface of the pinnules

between the veinlets, is stated to be widespread in America and Europe and to occur also in northern Asia. Conidial fructifications are formed during the growing season, and stromata in which the asci mature in the following spring. A study of the pathogen in relation to the eastern bracken, *Pteridium latiusculum*, is reported in some detail and infection is shown to be systemic and perennial, the fungus overwintering in rhizomes and frond buds. Infection of the maturing rhizome is confined to limited areas where its cells apparently soon die, but in the developing frond the fungus grows luxuriantly. In inoculation experiments with conidia, systemic infection and typical leaf roll symptoms resulted only from inoculation of young bracken sporophytes; localized infection followed the inoculation of young fronds or immature portions of older ones, and of the underground parts of mature plants.

Brooks (F. T.). **Some recent investigations on epidemic plant diseases.** —*Rep. Aust. Ass. Adv. Sci.*, xxiv, pp. 290–299, 1939.

The author discusses the relations of parasites to their host plants, especially from the standpoint of the establishment of disease in epidemic form, and deals with the influence of one parasite on the incidence of another. He suggests that some plant diseases are due to complexes of micro-organisms and incidentally points out that in the so-called 'watermark' disease of *Salix caerulea* in eastern England it has been found that even in naturally occurring early infections *Bacterium salicis* [*R.A.M.*, xvii, p. 356] is invariably accompanied by two other species of bacteria which are responsible for some of the histological symptoms.

Piper (C. S.). **The symptoms and diagnosis of minor-element deficiencies in agricultural and horticultural crops. Pt. I. Diagnostic methods. Boron. Manganese.**—*Emp. J. exp. Agric.*, viii, 30, pp. 85–96, 1940.

This is a critical discussion of some outstanding recent contributions to the diagnosis of plant diseases associated with boron and manganese deficiency, reference to most of which has been made from time to time in this *Review*.

Chupp (C.). **Further notes on double cover-glass mounts.**—*Mycologia*, xxxii, 2, pp. 269–270, 1940.

The following double cover glass mount, based on W. W. Diel's method (*Science*, N.S., lxix, p. 276, 1929), has been used with excellent results for mounting *Cercospora*, *Meliola*, and *Venturia inaequalis*. On the smaller of the two cover glasses used (one 22 or 18 mm. and one 12 mm.), the material, e.g., fungi, algae, or sections and bits of host tissue, is placed in a drop of Shear's mounting fluid which consists of 300 c.c. 2 per cent. potassium acetate (in water), 120 c.c. glycerine, and 180 c.c. 95 per cent. alcohol. The mount is heated over a microburner until most of the liquid is evaporated, then a drop of glycerine is added and the mount is slightly heated again. The cover glass with the material and the heated glycerine is then inverted, pressed down firmly on the larger cover glass, and all excess glycerine wiped off. The two glasses, the smaller one underneath, are next placed on a microscope slide on which a drop of medium-heavy balsam has been gently

heated, and the whole mount pressed down as the balsam spreads and seals the glycerine.

Krogh (A.). **A micro-climate recorder.**—*Ecology*, xxi, 2, pp. 275–278, 5 diags., 1940.

Full details are given of the construction and application of a micro-climate recorder combining the principles of Weickmann's pocket thermohygrograph (*Ber. Sächs. Akad. Wiss.*, lxxxix, 1938) with those of meteorological micro-recorders, and adaptable to the study of a wide range of scientific problems involving an exact knowledge of the prevailing temperature and humidity relations.

Went (F. W.). **Local and generalized defense reactions in plants and animals. Local reactions in plants.**—*Amer. Nat.*, lxxiv, 751, pp. 107–116, 1940.

In this paper (read at a joint meeting of five American societies at Columbus, Ohio, on 30th December, 1939) the author discusses local reactions of plants to parasitic attack from the standpoint of the host. These responses range from the death of the cell to greatly increased growth and the development of apparently new forms. In all cases, however, the new formations are within the potential range of development of the host, and in certain simple cases the new forms have been induced by chemically known substances. The effect of parasitic attack is to bring out potentialities, rearrange tissues, and develop new growth patterns.

Price (W. C.). **Generalized defense reactions in plants.**—*Amer. Nat.*, lxxiv, 751, pp. 117–128, 1940.

In this paper (read at the same meeting as the preceding), the author reviews and discusses the available evidence for the existence of acquired immunity to virus diseases in plants. Conclusive data show that plants affected with certain virus diseases develop a defence reaction beyond the natural immunity inherent in the plant. Plants may recover from some virus diseases, and become resistant to reinfection. The ensuing immunity is of the carrier type, since the plant continues to harbour the virus. Further, plant cells infected with one strain of a virus appear to become immune from infection by related strains. In such cases, immunity is generally of the chronic-disease type, the plants losing neither the virus nor the symptoms produced by it. In both types of immunity the nature of the defence mechanism is unknown.

Kausche (G. A.). **Über den Mechanismus der Goldsolreaktion beim Protein des Tabakmosaik- und Kartoffel-X-Virus.** [On the mechanism of the gold sol reaction of the Tobacco mosaic and Potato X virus.]—*Biol. Zbl.*, lx, 3–4, pp. 179–199, 9 figs., 1 graph, 1940.

This is a further explanatory account of the mechanism of the differential gold sol reactions of the tobacco mosaic and potato X viruses [*R.A.M.*, xviii, p. 543]. The experimentally established absorption and fixation of gold by these virus proteins has been shown not to impair their infectivity towards *Datura stramonium* and tobacco, respectively.

Adati (M.). **Untersuchungen über die Rhizosphäre der Pflanzen. Zweiter Bericht. Über die Einflüsse der verschiedenen Kulturpflanzen auf die Mikrobenzahl der verschiedenen Bodenarten in Formosa.** [Studies on the rhizosphere of plants. Second report. On the influence of various cultivated plants on the incidence of micro-organisms in the different Formosan soil types.]—*J. Soc. trop. Agric. Taiwan*, xi, pp. 57–65, 1939.

In the writer's studies on the influence of various economic crops on the incidence of the microflora in four types of soil in Formosa, the difference between the numbers in rhizospheres I and II (remote and immediate surroundings of the roots, respectively [cf. *R.A.M.*, xix, p. 422]), was greatest in sand and least in humus, loam and clay being intermediate in this respect. The influence of cereals on the development of soil micro-organisms was generally more powerful than that of legumes. To cite some figures from the tables, the number of moulds in rhizospheres I and II in sandy soil under wheat were 260,000 and 1,500,000 per gm., respectively, the corresponding figures for humus being 60,000 and 710,000, respectively; soy-beans: sand I and II, 170,000 and 4,350,000; humus I and II, 190,000 and 2,310,000; peas: sand I and II, 170,000 and 950,000; humus I and II, 310,000 and 1,200,000; flax: sand I and II, 110,000 and 1,600,000; humus I and II, 130,000 and 1,510,000; and tomatoes: sand I and II, 90,000 and 930,000; humus I and II, 230,000 and 2,080,000.

Young (H. E.). **Mycorrhizae and growth of Pinus and Araucaria. The influence of different species of mycorrhiza-forming fungi on seedling growth.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 21–25, 1940.

To ascertain whether some mycorrhiza-forming fungi might have a more favourable effect on the growth of *Pinus* than others under the conditions prevailing in Queensland [*R.A.M.*, xviii, p. 406], boxes of soil were sown with seed of *P. caribaea* and later inoculated with cultures of *Boletus viscidus*, *B. scaber*, *B. luteus*, *B. bovinus*, *B. elegans*, and *Russula* sp. obtained from Holland, and *B.* (?) *granulatus* from Java. A control box was inoculated with mycorrhiza found under a healthy stand of *P. caribaea*, both *B. granulatus* and *Rhizopogon roseolus* probably being present. Measurements made at the conclusion of the season's growth showed that the mean height of the seedlings inoculated with the fungi in question was, for each fungal species, respectively, 15·23, 14·99, 14·84, 14·82, 14·55, 13·51, and 13·21 in., as compared with 13·07 in. for the control seedlings, the corresponding mean weights being 14·63, 12·95, 11·21, 14·19, 10·79, 9·78, and 12·92 gm., with 9·31 gm. for the controls. It is concluded that different mycorrhiza-forming fungi, as represented by the species tested, may vary greatly in their ability to stimulate growth in one species of tree associate.

In pure culture experiments hoop pine (*Araucaria cunninghamii*) seedlings produced mycorrhiza when grown in association with *B. granulatus* and also with an undetermined fungus constantly isolated from naturally occurring hoop pine mycorrhiza. The latter fungus was similar in culture to and perhaps identical with *B. granulatus*. Hoop pine seedlings failed to develop in pure culture in the absence of a mycorrhizal

fungus. In field experiments the two fungi in question did not produce any different effect on the growth of hoop pine seedlings. In both flask and box experiments the fungi produced endotrophic mycorrhiza with hoop pine; with *Pinus, B. granulatus* produces ectendotrophic mycorrhiza, and it seems that with the *B. granulatus-Pinus* and *B. granulatus-Araucaria* associations the nature of the mycorrhiza depends on a host, rather than a fungus, reaction.

WAGNER (F.). **Die Bedeutung der Kieselsäure für das Wachstum einiger Kulturpflanzen, ihren Nährstoffhaushalt und ihre Anfälligkeit gegen echte Mehltaupilze.** [The importance of silicic acid for the growth of some cultivated plants, their metabolism, and their susceptibility to true mildews.]—*Phytopath. Z.*, xii, 5, pp. 427–479, 15 figs., 1 diag., 3 graphs, 1940.

The writer's extensive laboratory and outdoor experiments at the Bonn Phytopathological Institute confirmed the observations of previous workers as to the beneficial effects of silicic acid on the resistance of certain cultivated plants to mildews. In some instances, in fact, a modicum of the element in the nutrient solution was indispensable to growth, barley plants being practically destroyed at an early stage in its absence by *Erysiphe graminis* [*R.A.M.* xvi, p. 519], whereas those supplied with appropriate amounts showed a high degree of resistance. With oats the results were less clear-cut. Silicic acid also strengthened the resistance of cucumber to mildew [*E. cichoracearum*: ibid., xviii, p. 651] and prolonged the incubation period.

In 6-kg. pot experiments with cucumbers the addition to the soil (marsh) of 20 gm. calcium silicate or 15 gm. sodium silicate lengthened the incubation period and increased resistance to mildew, without, however, entirely controlling the disease. In similar tests with barley the incidence of *E. graminis* was found to stand in direct relation to the soluble silicic acid content of the soil, being much lower in clay and black earth than in quartz sand or marshland. The readily soluble potassium silicate proved slightly superior to the calcium salt for increasing the silicic acid content of the plants and thereby conferring resistance to mildew. Susceptibility to infection was found to increase with rising hydrogen-ion concentration.

In field experiments with summer barley on marshland, humus-sand, and clay, the admixture of silicates increased the assimilation of silicic acid but exercised no appreciable effect on the course of infection by *E. graminis*. It is concluded that the specific use of silicic acid is scarcely justifiable as a general means of mildew control, but that fertilizers containing it should be applied to soils deficient in this constituent.

KÖHLER (E.). **Weitere Studien über die Vira der Y-Gruppe der Kartoffel.** [Further studies on the Potato viruses of the Y group.]—*Phytopath. Z.*, xii, 5, pp. 480–489, 4 figs., 1940.

Continuing his studies on potato viruses [*R.A.M.*, xviii, p. 472], the author investigated two strains of the A group (P 716/17 and P 716/12) and four of the Y type (GA, DJ, Go, and 2A, the first three derived, respectively, from the potato varieties Gustav Adolf, Direktor Johanssen,

and Goldgelbe, and the last-named from the type strain GA). The representatives of the A and Y groups were found to differ in the following respects: *Nicotiana glutinosa* and *Solanum racemigerum* [*S. pimpinellifolium*] are susceptible to Y but immune from A; the thermal death point (ten minutes' exposure) is 58° C. for the Y strains as against 50° for those of A; and infection by the A virus does not protect its hosts against subsequent invasion by Y or conversely, though attack by a weak strain of Y confers resistance to a stronger member of the same group. Other workers have found serological differences between the A and Y strains. The Y antiserum obtained by Stapp and Bercks, for instance (paper of the *Arb. biol. Reichsanst., Berl.*, in the press) was inactive towards the writer's two A strains but agglutinated the Y strain GA.

Skaptason (J. B.), Peterson (L. C.), & Blodgett (F. M.). **The copper content of Long Island soils in relation to tuber rot of Potatoes caused by Phytophthora infestans.**—*Amer. Potato J.*, xvii, 4, pp. 88–92, 1940.

Analyses of Long Island soils used continuously for potato cultivation for periods from 18 to 32 years revealed the presence of large residual quantities of copper (up to one-third of the total amount applied) resultant on the systematic treatment of the crops with Bordeaux mixture for the control of late blight (*Phytophthora infestans*). It is suggested that the virtual inhibition of sporangial germination in the pathogen by the accumulated copper in the soil may account for the very low incidence of tuber rot (as opposed to foliar symptoms) in the local stands despite the almost annual prevalence of temperature and humidity conditions conducive to infection.

Muller (K. O.), Meyer (G.), & Klinkowski (M.). **Physiologisch-genetische Untersuchungen über die Resistenz der Kartoffel gegen Phytophthora infestans.** [Physiologic-genetical studies on Potato resistance to *Phytophthora infestans*.]—*Naturwissenschaften*, xxvii, 46, pp. 765–768, 1 graph, 1939.

In continuation of the first-named author's studies at the Biological Institute, Dahlem, Berlin, on the physiological and hereditary bases of resistance in the potato to late blight (*Phytophthora infestans*) [*R.A.M.*, xvi, p. 53], histological and cytophysiological observations were carried out on the diseased tuber tissues of resistant (W) and susceptible commercial varieties (e.g., Parnassia), with the following results. In the case of susceptible sorts, the parasitized cells (primarily those of the intercellular spaces) undergo five characteristic phases [which are described in detail], culminating in death after a relatively lengthy period (6 to 14 days) at the optimum temperature for the pathogen of 19° C. The process may thus be described as one of necrobiosis in which the cells survive until a comparatively advanced stage. Reaction to *P. infestans* appears to vary even among individual cells of genotypical identity: hence the observed differences in response between tubers and foliage, in which connexion the axiom is established that resistance in the foliage does not necessarily connote the same property in the tubers,

though conversely, resistant tubers inevitably produce the same type of leaves.

Tracing the course of the pathogen through the phases of the disease, the writers found that the 'vitality' of the fungus is adapted to that of the host. Thus, at 19°, sporangia are formed on the third day after inoculation (phases 1 to 2), and by the sixth (1 to 4) the zenith of development, judged by the profusion of fructifications, is already past; from the seventh to the eighth day (4 to 5), when the host cells are largely necrotic, there is practically no further growth of the parasite.

Observations on resistant varieties showed the development of the fungus in the tissues to be very poor, the hyphae extending only for a maximum depth of 20 to 30 cell layers. Sporangia are not formed. Even here, however, a brown discoloration marks the entry of the hyphae after a period of 36 to 48 hours, corresponding to the final phase of infection in the susceptible varieties. The whole difference between resistance and susceptibility to *P. infestans* lies, therefore, in the rapidity of production of the substance toxic to the invader; if the host cell develops this substance quickly the plant is resistant; if slowly, it is susceptible. The function of the genes conferring resistance or susceptibility thus appears in an altogether new light as merely determining the speed of the defensive reactions, and not the presence or absence of the antitoxin. To test the validity of this theory, an experiment was conducted to determine whether the rapidity of growth of the parasite could be sufficiently retarded to enable the host cells to reach the final phase soon enough to check the progress of invasion. This was accomplished by the storage of inoculated Parnassia tubers (after four days at 19°, during which the fungus penetrated 10 to 12 mm. into the tissues) at 0° to 2° for periods of 3 to 21 weeks. By the end of the 15th week the pathogen was no longer in a condition for further advance. The fact that in pure cultures on nutrient agar at 2° the organism survived for considerably longer periods is regarded as definitely pointing to the secretion by the dying or dead host tissues of a substance toxic to its invader, rather than to the direct influence of temperature on the course of infection. The susceptible varieties are thus considered to be inherently capable under appropriate conditions of the same defensive reactions as those induced in the resistant types by the 'resistance genes' ('accelerators'). An analogy with the sex genes, which merely act as carriers in one sex of characters potentially common to both, will readily be apparent.

Edmundson (W. C.) & Schaal (L. A.). **Potato breeding for Fusarium resistance.**—*Amer. Potato J.*, xvii, 4, pp. 92–95, 1 fig., 1940.

Promising results in the development of seedling potatoes for resistance to *Fusarium oxysporum* and *F.* [*solani* var.] *eumartii* [*R.A.M.*, xix, p. 360] in Colorado were obtained in 1938–9 with Nos. 2134, 2135, and 47053, which combined relative freedom from infection with a satisfactory yielding capacity. Nos. 1221 and 110 and Katahdin, though more severely attacked and less productive than the foregoing, nevertheless compared favourably in both respects with Rural New Yorker, Triumph, and Earlaine.

Folsom (D.) & Rich (A. E.). **Potato tuber net-necrosis and stem-end browning studies in Maine.**—*Phytopathology*, xxx, 4, pp. 313–322, 1 fig., 1940.

The transitory symptom of potato leaf roll known as net necrosis may be distinguished in various ways from the non-parasitic stem-end browning in Maine [*R.A.M.*, xvii, p. 479], where a comparative study of the two diseases was made during the winter of 1937–8.

Microscopically, stem-end browning differs from net necrosis in its involvement of both phloem and xylem, only the former being affected by leaf roll. Hill [ibid., xviii, p. 475] mentions other points of contrast also. Using depth of penetration as a gauge, discoloration in more than one ring of a cross section of a tuber at 12 mm. from the stem end generally connoted incipient leaf roll, whereas the zone invaded by stem-end browning extended to less than that distance. Stem-end browning is usually of a darker colour than net necrosis, the discoloured strands being fairly continuous instead of disconnected, and involves a smaller number of concentric zones than net necrosis.

Prior to 1921, net necrosis appears to have occurred only sporadically in Maine but outbreaks of both this disease and stem-end browning were recorded in the State in 1923 and 1939. Up to 20 per cent. stem-end browning occurred in the 1936 crop from Aroostook County, where 19 per cent. of the tubers in 40 bins of the 1937 Green Mountain crop were affected by net necrosis. Neither disorder has so far been observed in the Katahdin and Chippewa varieties. The ratio between the percentages of the leaf roll and net necrosis phases in individual lots of 29 Green Mountain stocks ranged from 1 : 1 to 9 : 1, indicating that the presence of net necrosis serve as a general guide to the incidence of leaf roll, but it is scarcely a reliable indicator for individual batches of tubers.

Stem-end browning was experimentally shown to exert no adverse effect on yield, neither has any evidence been obtained of its perpetuation through the seed. The underlying cause of the trouble would seem to reside in some environmental condition or complex of conditions in the field, but so far no correlation has been established between stem-end browning and soil type, previous occurrence in the soil, previous fertilizer treatment, soil nutrients, hydrogen-ion concentration, or moisture, presence of virus diseases, origin of commercial strain, injury to the parent plant, time and method of digging, and certain storage conditions. Within a given stored lot, stem-end browning was negatively correlated with tuber weight (average in two lots 4·61 and 3·56 oz.) and net necrosis positively (5·03 and 5·56 oz.).

Martin (A. L.) & Altstatt (G. E.). **Black kernel and white tip of Rice.**—*Bull. Tex. agric. Exp. Sta.* 584, 14 pp., 2 figs., 1940.

The results of an investigation into rice diseases in Texas, begun in 1937, showed that *Curvularia lunata* is the fungus most frequently associated with black kernels [*R.A.M.*, xix, p. 43], being found in 40 to 80 per cent. of all black grains. *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xviii, p. 546] and *Alternaria* sp. are also capable of producing black kernels but tend to make the grains soft and chalky,

so that they disintegrate during milling. Black specks on the grains caused by *Trichoconis caudata* [loc. cit.] are usually rubbed off at the same time. *C. lunata* is the only organism that does not destroy the hard, grain-like structure of the kernel, although it causes entire discoloration.

The results of inoculation experiments showed that *C. lunata* does not produce a systemic infection. Infection of soil, stem injections, or spraying with spore suspensions failed to produce infected seeds, but dipping or spraying the blossoming rice heads in an aqueous spore suspension or dusting them with pulverized black kernels resulted in a large number of discoloured grains. *C. lunata* was frequently isolated from rice grains showing black spots and it was believed that such infections were carried by insects. Hypodermic injection of *C. lunata* spores into rice seeds in the milk and mature stages in imitation of insect bites in the field gave 100 per cent. infection, a few typical black kernels being produced and every inoculated seed showing a minute, dark spot caused by the needle puncture. It is suggested that insects are instrumental in spreading the disease in the field, but many of these infections fail to develop unless the grain becomes damp and heated in the shock or stack. The following are the control measures recommended against black kernel: destruction of all rice straw stacks immediately after threshing; cutting and burning of weeds and volunteer rice; growing the late crop as far as possible from the early one to prevent the fungus spores stirred up by the threshing of the latter infecting the former; and keeping the grain and shocks dry to avoid heating.

The results of observations on white tip of rice have already been noticed from an earlier paper [ibid., xix, p. 363]. It is suggested for the control of this condition that small-scale trials should be conducted locally to ascertain the requirements of a given soil area. It is recommended generally to apply 200 to 300 lb. magnesium sulphate or 500 lb. of a high magnesium lime per acre.

KATZNELSON (H.). **Survival of microorganisms introduced into soil.**—*Soil Sci.*, xlix, 4, pp. 283–293, 1940.

All the micro-organisms, comprising a number of typical soil bacteria, fungi, and Actinomycetes, inoculated into five soils of varying organic matter content at the New Jersey Agricultural Experiment Station [*R.A.M.*, xix, p. 431] rapidly decreased in prevalence, while three, including *Fusarium culmorum*, disappeared altogether. The only instance in which this fungus survived for 105 days in two soils, one acid and the other deficient in organic matter, was in the presence of 1 per cent. lucerne. The soils harbouring the maximum numbers of *Pseudomonas fluorescens* (the persistence of which was also stimulated by the addition of dried blood or lucerne) and *F. culmorum* were the most active microbiologically. It is suggested that the survival of these two organisms is correlated with their capacity for the utilization of the various decomposition products of the stimulatory substances.

REICHERT (I.). **Diseases of industrial and medicinal plants.**—*Int. Bull. Pl. Prot.*, xiv, 4, pp. 77–78, 1940.

Continuing his enumeration of crop diseases in Palestine [*R.A.M.*,

xviii, p. 518; xix, p. 225], the writer (with the assistance of M. Chorin, G. Minz, J. Perlberger, and F. Littauer) presents a list of fungal, virus, and non-parasitic disorders of industrial and medicinal plants.

Thomas (K. M.) & Krishna Menon (K.). **The present position of pollu disease of Pepper in Malabar.**—*Madras agric. J.*, xxvii, 10, pp. 348–356, 16 figs., 1939.

'Pollu' disease of pepper (*Piper nigrum*) [*R.A.M.*, xii, p. 267], an important contributory factor in the steady decline of the Indian export trade in this commodity since 1933–4, is characterized by hollow and light berries due to three causes, viz., physiological spike shedding, attacks by the flea beetle *Longitarsus nigripennis* and an unspecified gall fly, and a fungus, *Colletotrichum* sp., which is responsible for 4 to 13 per cent. of the total loss from the disturbance, amounting in some years to 50 per cent. of the marketable produce. The fungus produces circular or irregular grey spots on the leaves, on the upper surface of which the black acervuli appear in concentric rings. Stem infection begins at the tips and spreads downwards, gradually killing the young vines and tender runners from old ones. In old vines the attack starts in the branching region and the fungus is found near the nodes of the dead branches. The spikes are usually invaded at the site of their junction with the stem, the leaf axils whence they emerge affording favourable positions for the accumulation of water drops and spores washed down from the leaves. Once inside the spikes the fungus induces rotting of the tissue and shedding, especially in shaded and damp plots. The fungus also develops on the stalks of the spikes. On the berries a dirty brown discoloration of the rind commences from the top and extends downwards, sometimes accompanied by cracking. Further studies on the disease are planned.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1939.—39 pp., 5 graphs, [? 1940].

In this report [cf. *R.A.M.*, xviii, p. 623] it is stated that in breeding work against sugar-cane mosaic in Barbados 12 seedlings have been tested for 15 months or more without developing any symptoms of the disease.

A table is given showing the reaction to mosaic of certain Barbados seedlings tested in Jamaica and Uganda, as compared with their reaction in Barbados. The results are not final, but show clearly that apparent resistance in Barbados does not necessarily mean that the same seedling will prove to be resistant in Jamaica or elsewhere. If further reports confirm that B. 35187 (apparently resistant in Barbados) is susceptible in Jamaica, the strain of mosaic in that colony will have been proved to be different from the Barbados strain, and probably more virulent.

Mourashkinsky (K. E.). Горно-таежные трутовики Сибири. [Tinder fungi of the mountain forests of Siberia.]—*Trans. Omsk Inst. Agric.*, xvii, pp. 75–108, 17 figs., 1939.

This list of 20 of the rarer Polyporaceae, witn notes on their morphology, habitat, and world distribution, is based on numerous collec-

tions made during 1921 to 1937 in the mountainous forests of Siberia (chiefly western districts).

Mourashkinsky (K. E.). Трутовики Сибири. II. О некоторых видах на лиственных породах [Tinder fungi of Siberia. II. On species attacking deciduous trees.]—27 pp., Omsk, Сель-хоз. Инст. им. С. М. Кирова [S. M. Kiroff's Inst. Agric.], 1940. Roub. 1.

This annotated list comprises seven Polyporaceae found on deciduous trees in Siberia [see preceding abstract].

Chardon (C. E.), Miller (J. H.), & Muller (A. S.). **Ascomycetes from the State of Minas Geraes (Brazil).**—*Mycologia*, xxxii, 2, pp. 172–204, 37 figs., 1940.

This list of Ascomycetes collected in the State of Minas Geraes, Brazil, consists of 114 species, 21 of which are described as new [with Latin diagnoses], the following being worthy of mention: *Claviceps paspali* on *Paspalum* spp.; *Gibberella saubinetii* on rice, wheat, and maize; *Ceratostomella fimbriata* on *Crotalaria juncea*; *Phyllachora anonicola* Chardon n. sp. on soursop (*Anona* [*Annona*] *muricata*); *P. tropicalis* on guava; and *Discohainesia oenotherae* on strawberry (*Fragaria chiloensis*).

Snyder (W. C.) & Hansen (H. N.). **The species concept in Fusarium.** —*Amer. J. Bot.*, xxvii, 2, pp. 64–67, 1940.

The authors express the opinion that the Wollenweber classification of the genus *Fusarium* [*R.A.M.*, xiv, p. 708] is not sufficiently usable for the average worker and in the section *Elegans* in particular the species at present so overlap one another as to make satisfactory determination very difficult [cf. ibid., xiii, p. 143]. As a result of several years of intensive studies it is proposed that the species be based only on morphology and the forms on physiology (pathogenicity). This new concept of species is intended as a modification within the framework of Wollenweber's system, and it is stated to simplify species identification and to eliminate a multiplicity of names. For the section *Elegans* the new concept is formulated as follows: all members of the section constitute one natural group species which on the bases of usage and priority may be called *F. oxysporum*. This species is emended to reflect the basic morphologic features of the whole section in agreement with the description of section *Elegans* given by Wollenweber (1913). The parasitic forms in the section are recognized principally by their selective pathogenicities and are designated as distinct forms, while all saprophytic ones are classified as merely *F. oxysporum*. The species itself can be readily determined on morphologic criteria, and the distinct biologic forms by pathogenicity tests. A list is given of the 25 forms of *F. oxysporum* now recognized and named with their synonyms. [These are listed with full citations in the Supplement to this *Review* issued in July, 1940.]

Jenkins (Anna E.). **Taphrina carveri recently discovered in Missouri.** —*Mycologia*, xxxii, 2, pp. 266–267, 1 fig., 1940.

Taphrina carveri [*R.A.M.*, xviii, p. 718] was collected in 1939 on

silver or white maple (*Acer saccharinum*) in Missouri, this being the first record of the species in the field since 1897.

Lauffer (M. A.) & Price (W. C.). **Thermal denaturation of Tobacco mosaic virus.**—*J. biol. Chem.*, cxxxiii, 1, pp. 1–15, 3 graphs, 1940.

The thermal denaturation of the tobacco mosaic virus was found in studies at the Rockefeller Institute for Medical Research to be a readily reproducible phenomenon and was shown to be a reaction of the first order. The energy of activation of the reaction in 0·1 M phosphate buffer at P_H 7 was computed to be about 153,000 calories per mole. The rate of the reaction at a given temperature was ascertained to be strongly influenced by modifications in the hydrogen-ion concentration, more rapid progress being made in alkaline than in acid solutions. The reaction rate also varied inversely with the initial virus concentration, being roughly twice as great in systems with an initial concentration of 3 mg. per ml. as in solutions with an initial concentration of 6 mg. per ml. Thermal inactivation of the virus [*R.A.M.*, xix, p. 370], using the bean [*Phaseolus vulgaris*] as a test plant, was found to proceed more rapidly than denaturation, measured by precipitation.

Best (R. J.). **Some effects of salicylate on plant viruses.** *Nature, Lond.*, cxlv, 3677, pp. 627–628, 1 graph, 1940.

In the course of an investigation at the Waite Research Institute, University of Adelaide, on the effect of various anions on the precipitation of the paracrystalline solid phase of the tobacco mosaic virus (*Marmor tabaci* var. *vulgare* Holmes) [*R.A.M.*, xviii, p. 607] nucleoprotein from its solution in water, the salicylate ion was found to occupy a special position. The precipitate produced by potassium salicylate solutions at concentrations above 0·46 M consists of an insoluble, amorphous, white, granular deposit of denatured protein, the mechanical agitation or dilution of which does not cause re-solution. At the same time there is an irreversible loss of infectivity of the virus. The rate of inactivation is shown by graphical data to increase parallel with rising concentrations of salicylate and to follow a logarithmic course; it is further stated to be markedly influenced by temperature. With solutions of the salicylate of the order of 0·5 M inactivation was only partial, and at 0·1 M there was no loss of infectivity, stream double refraction, or solubility after 48 hours.

The tomato spotted wilt virus (*Lethum australiense* var. *typicum*) [loc. cit.] was found to be much more susceptible than tobacco mosaic to the inactivating effect of salicylates, succumbing after one hour to a 0·1 M solution of potassium salicylate. In this instance cystein was used to arrest oxidative inactivation of both the control and test suspensions.

Costa (A. S.), Lima (A. R.), & Forster (R.). **Necrose branca — uma moléstia de virus do Fumo (Nicotiana tabacum L.) e 'Fumo couve' como sintoma tardio.** [White necrosis—a virus disease of Tobacco (*Nicotiana tabacum* L.), and 'cabbage Tobacco' as a late symptom.] —*J. Agron., S. Paulo*, iii, 1, pp. 1–26, 24 figs., 1940. [English summary.]

Of recent years a virus disease has been observed affecting Virginia

Bright, Samson, Turkish, Kentucky, Flor Branca, Geudertheimer, and other tobacco varieties, as well as *Nicotiana sylvestris*, in several districts of São Paulo, Brazil. The symptoms develop in three successive stages, of which the two first, viz., white necrosis and apparent recovery, correspond in every particular with J. Johnson's streak [*R.A.M.*, xv, p. 535], while the third or 'cabbage-leaved' phase appears to be new. Its principal features consist in a thickening of the leaves, which are also of a smoother texture than those of healthy plants. Certain varieties with normally sessile leaves acquire a typically petiolate habit, while those ordinarily furnished with petioles exhibit modifications, Turkish, for instance, losing the remnants of the alae and auricles. The flower petals are partially separated, the upper end generally apiculate, with a tendency to shedding; the capsules formed are semi-sterile.

The disease was transmitted by grafting and rubbing to *N. glutinosa*, *N. rustica*, *N. alata*, *N. repanda*, *N. langsdorffii*, *N. longiflora*, *Solanum nodiflorum*, and *Nicandra physaloides*. On *Nicotiana sylvestris* and *N. repanda* the symptoms closely resemble those observed on tobacco: the other hosts generally develop a tapering foliar habit and partial separation of the petals.

The thermal death point of the virus under observation (white necrosis stage) lies between 50° and 55° C., its period of ageing *in vitro* ranges from 12 to 24 hours, and its tolerance of dilution is 1 in 100. These physical properties approximate very nearly to those of tobacco streak, and in conjunction with the symptomatological similarities suggest a close relationship.

Koenig (P.). **Die Entwicklung der Reichsanstalt für Tabakforschung in Forchheim in zwölfjähriger Tätigkeit (1927–1938).** [The development of the Reich Tobacco Research Station at Forchheim during its twelve years of activity (1927–1938).]—*Landw. Jb.*, lxxxix, 5, pp. 651–668, 1940.

Phytopathological studies at the Forchheim (Baden) Tobacco Research Institute from 1927 to 1938 were largely concerned with the formidable problem of wildfire [*Bacterium tabacum*: *R.A.M.*, xv, p. 119; xvii, p. 205]. It is concluded from the investigations that the disease is not, as alleged, a new one introduced from America into Europe in 1916 and into Germany in 1924 [ibid., vii, pp. 125, 547], but merely the familiar 'rust' or 'frog eye' in different forms [cf. ibid., ix, p. 226].

De Fluiter (H. J.). **Proeven en waarnemingen in verband met de bestrijding van het bruinvlek, Alternaria longipes (Ell. et Ev.) Mason.** [Experiments and observations in connexion with the control of brown spot, *Alternaria longipes* (Ell. & Ev.) Mason.]—*Meded. besoek. Proefst.* 65, pp. 1–40, 1 fig., 1939.

The outcome of the writer's intensive studies on the possibilities of combating tobacco brown spot (*Alternaria longipes*) [*R.A.M.*, xviii, p. 555], with which *Cercospora nicotianae* is stated to be almost invariably associated at the Besoeki (Java) Experiment Station [ibid., xvii, p. 490], may be summarized as follows. The methods tested were (I) chemical, (II) cultural, and (III) selective.

(I). In a large-scale field trial with the Kedoe variety, two to three applications of ammoniacal copper sulphate emulsion (45 gm. 25 per cent. commercial ammonia, 360 gm. soft soap, 70 gm. copper sulphate, and 18 l. water), Wacker's kupferkalk (1 per cent.), or Bordeaux mixture (180 gm. copper sulphate, 135 gm. unslaked lime, and 18 l. water) substantially increased the percentage of slightly infected plants and reduced that of severely diseased ones in relation to the untreated controls. These copper-containing mixtures, however, especially Bordeaux, caused extensive bleaching of the foliage and accentuated the pungency of the aroma in smoking—to an unpleasant degree in the case of Bordeaux. There was little difference in the results secured with two or three treatments, while in many cases a single application was equally efficacious. In another test on Hybrid 238 Bordeaux mixture tended to reduce the incidence of heavy infection on the thin leaves, but the differences between the treated and control plants were unimportant and inconsistent. There was no adverse effect on the aroma of the tobacco in this variety.

Chemical treatment against *A. longipes* would appear to offer little hope of success from a practical standpoint for the following reasons: the maximum severity of the pathogen at a critical period (just before or during plucking); the tendency of the appropriate fungicides to discolour the leaves and impair the aroma of the finished product; dependence on weather conditions; and the expenses incidental to the operations.

(II). Of the various cultural measures tested against brown spot, topping appeared rather to promote than hinder the attacks of the fungus, manuring gave conflicting results, and no definite conclusions can be drawn from the spacing trials, though some strongly suggestive indications were obtained that infection, particularly of the coarser leaves, increases parallel with the distance between the plants (Kedoe). Precocious maturity, a decisive contributory factor in the development of brown spot, should be avoided by the following precautions: not replanting every year on the same site; the interpolation of two or more rice crops between the tobacco seasons; timely preparation of the soil, thorough tillage and drainage, and the careful performance of such operations as weeding, banking up, and the like; the application of a fertilizer where indicated; early plucking; and sanitation of the plantations by (*a*) the removal and digging under or burning, at the onset of plucking, of the yellow or brown shrivelled lower leaves already infected by the fungus, and (*b*) the disposal, immediately after plucking, of the infected stalks.

(III). In selection tests there were no marked differences in susceptibility to *A. longipes* between the Hybrids Nos. 343, 344, and 362, but 238 contracted much heavier infection than the others, while a cross between this line and Canari was the most severely attacked of all. Lines 320 and 322 of Kedoe were much more resistant than 103 and 303.

In laboratory tests the conidia of the fungus began to germinate after half an hour in drops of water at an initial temperature of 27·4° C., rising slightly during the course of the experiment; after two hours germination was practically complete and hyphal production had begun.

Shear (G. M.) & Ussery (H. D.). **Frenching of Tobacco distinguished from thallium toxicity by spectrographic analysis.**—*J. agric. Res.*, lx, 2, pp. 129–139, 1 pl., 1940.

In studies on the relationship between frenching and thallium toxicity of tobacco [*R.A.M.*, xix, p. 438] undertaken in 1937 in Virginia, spectrographic analyses were made of the ash from healthy, frenched, and thallium-treated plants and also of samples of soil in which frenched tobacco had grown. Thallium was detected only in ash samples from plants grown in a nutrient solution to which thallium nitrate had been added, showing that frenching is not the same as thallium toxicity. It was possible to detect thallium in ash samples in amounts of less than 0·0001 per cent. and in ash samples from plants receiving only 0·016 of a part per million of thallium in the nutrient solution. The results of experiments with tobacco grown in culture solutions of varying nutrient and thallium content indicated that the weaker the solution the smaller the amount of thallium necessary to produce toxic symptoms. It was found that thallium is fixed in the tobacco plant in a way to produce a marked gradient, decreasing from the roots to the tips of the shoots. It is concluded, therefore, that the plant must have a continuous supply of available thallium if thallium toxicity symptoms are to continue to appear on the young leaves as they are produced. Gallium did not appear to have any relationship to frenching or thallium toxicity in tobacco.

Frimmel (F.) & Lauche (K.). **Versuch einer Bekämpfung der Mosaikkrankheit der Tomaten.** [An experiment in the control of mosaic disease of Tomatoes.]—*Obst- u. Gemüseb.*, lxxxvi, 1, pp. 2–3, 1 graph, 1940.

The writers observed in the course of attempts to control tomato mosaic at the Mendel Horticultural Experiment and Research Station, Eisgrub [Moravia], that the increase in blossom production runs roughly parallel, up to the third week in July, with the multiplication of the insect vector of the disease (*Thrips*) [but see *R.A.M.*, x, p. 64], which resides in the anther tubes. From this stage onwards, however, the two processes follow a divergent course, the flower production sinking while the propagation of the insect continues to rise until about the first week in August. The vectors are now compelled to migrate to their winter quarters in the soil, and the extensive spread of infection commonly noted during the second half of August is undoubtedly associated with this mass movement. At this critical juncture, therefore, it is essential to prevent the onset of migration by topping the plants down to below the last flower truss and burning the debris. By this means the number of insects was reduced from 60 per 100 flowers in 1937 to 40 in 1938 and 21 in 1939.

Ivanoff (S. S.) & Young (P. A.). **Tomato fruit pox.**—*Phytopathology*, xxx, 4, pp. 343–344, 1 fig., 1940.

In south-western Texas in 1937 green tomato fruits were observed to bear a number of scattered, abnormally dark green, circular, elongated, or irregular dots, up to 3 mm. in diameter, imparting a mottled appearance and tending to predominate along the region extending

from the stylar scar to the pedicel. Several of the spots may coalesce to form streaks, while at a later stage many become sunken as pits or pox with ruptured surface tissues. The mottle spots occur on fruits of all ages, while those approaching maturity are more liable to show the pox phase, the transition from one form of the disorder to the other taking place in a few days. As the fruits colour, the dark green spots remain green or turn yellow, while the pox may cork over and appear as an abnormally large lenticel on the fruit surface. Besides excluding the affected fruits from the first grade, the pox spots may serve as foci of infection for fungi and bacteria. Fruit pox has been detected in five seasons of spring and autumn crops in the Winter Garden district where serious economic losses were sustained from the disease in the autumn of 1938 through the rejection of 10 per cent. of the harvested fruit. The Pritchard and Stokesdale are the most susceptible varieties in Texas, but Marglobe, Rutgers, Bonny Best, Earliana, Summerset, and Globelle have also been affected. The etiology of fruit pox, which has since been found in Illinois and Wisconsin and on fruit from Florida, Mexico, Puerto Rico, and Cuba, is still obscure.

SMALL (T.). **Tomato stem rot or canker (Didymella lycopersici Kleb.).** —*Rapp. aux États de Jersey, 1939*, pp. 22–32, 1940.

During the past ten years tomato blight (*Phytophthora infestans*) has declined in importance in Jersey, as a result of efficient spraying, but stem rot (*Didymella lycopersici*) [*R.A.M.*, xix, p. 68] has become more prevalent and destructive and is now the most serious fungal disease affecting outdoor tomatoes locally. In 1939 thousands of plants were killed by stem rot before any fruit had been picked. Early in the season the attack was confined to the main stem at soil level, but later all the aerial parts were affected, including the fruit. In May, only 2 to 4 weeks after transplanting from the propagating boxes, four growers lost 5,000 plants out of 12,000, 1,000 out of 7,000, 5,000 out of 22,000, and 4,000 out of 14,000. The available evidence suggested that infection came from the seed-box stage.

In 1938 only one example of stem rot was observed in young plants in boxes. In 1939 six examples were found, but very few seedlings were affected. When seedlings were grown in artificially infected soil, very few developed the disease, which indicates that at this stage plants are seldom attacked.

Experiments [which are described, and the results of which are tabulated] showed that tomato plants immersed in a spore suspension of the fungus before transplanting in the field became infected, the addition of Cheshunt compound to the spore suspension ($\frac{1}{2}$ and 1 oz. per gal.) failing to prevent infection. The first signs of stem rot developed on the main stem at (or occasionally just above) soil-level about 4 weeks after the plants had been set out in the field. These experiments show that the dipping of seedlings in contaminated water (perhaps contaminated in practice from a few infected seedlings) before planting may cause widespread infection and may possibly account for the serious losses incurred in May, 1939.

The fungus remained alive for over 12 months on tomato stems kept out-of-doors, and experimental evidence also showed that infection

may be contracted from soil containing diseased tissue from the previous season. In field tests infection was comparatively general and rapid when inoculum was placed in contact with the plants, but less so when the inoculum was placed one inch away from the stems. Also, when diseased plants were replaced immediately with others, the latter contracted the disease from the soil. Young infected plants may form a new root system and continue to grow for a considerable period before wilting.

The following tentative suggestions are made for control. Seed should be taken from healthy fruits. Old tomato stalks should not be used in the compost, and all compost soil should be steam sterilized or baked for 20 to 30 minutes at 210° to 212° F. All containers must be clean. Before transplanting, seedlings should be watered with a hose or watering-can instead of being immersed. Old canes used as supports should be disinfected with formaldehyde. Growers should try removing the leaves, when plants are dry, below the first truss while they are still healthy; a few should be removed when the third truss is reached, and a few more when the next trimming and tying are effected. The 'leg' should be sprayed two or three times during the season. As first crop tomatoes generally develop more stem rot than the second crop, the effect of planting second crop tomatoes should be tried. All old tomato plants and fruits should be removed from the field at the close of the season.

Bohn (G. W.) & Tucker (C. M.). **Studies on Fusarium wilt of the Tomato. I. Immunity in Lycopersicon pimpinellifolium Mill. and its inheritance in hybrids.**—*Res. Bull. Mo. agric. Exp. Sta.* 311, 82 pp., 7 figs., 1 diag., 1 graph, 1940.

This is a full account of the authors' studies on the resistance of tomato to wilt (*Fusarium bulbigenum* var. *lycopersici*), a preliminary report of which has already been noticed from another source [*R.A.M.*, xviii, p. 766].

Gilman (J. C.) & McNew (G. L.). **Fungi associated with tree cankers in Iowa. II. Diaporthe, Apiodiaporthe, Cryptodiaporthe, Pseudovalsa and their related conidial forms.**—*Iowa St. Coll. J. Sci.*, xiv, 2, pp. 129–153, 5 pl., 1940.

This further instalment of the writers' studies on the fungi associated with tree cankers in Iowa [*R.A.M.*, xv, p. 408] comprises descriptions of 12 species of *Diaporthe*, 1 of *Cryptodiaporthe* [ibid., xviii, p. 414], 2 of *Apioporthe*, 2 of *Pseudovalsa*, 8 of *Phomopsis*, and 3 of *Coryneum*. A key to the species is furnished.

Dodge (B. O.). **Two serious diseases of shade trees.**—*J. N.Y. bot. Gdn*, xli, 484, pp. 93–94, 1940.

Since 1935 London planes (*Platanus acerifolia*) have been suffering severe damage in Pennsylvania, Maryland, and New Jersey from a blight caused by a species of *Ceratostomella* which is still under investigation by Federal and State plant pathologists. Over 1,000 trees are reported to have been killed by the disease near Baltimore and more than 7,000 round Philadelphia and adjoining districts of New Jersey. The first symptoms appear in the form of cankers on the old bark and

brown streaks in the new underlying cortex of the trunk or large limbs; in cross sections the brown streaks show as radiating black lines extending for some distance into the trunk. Pirone, investigating the disease in New Jersey, believes that infection may spread through root grafts from one tree to another in the same row. Cracking of the bark and pruning wounds predispose the trees to infection, 50 per cent. of which in certain plantings has been found associated with cuts. The fungus may also be transmitted by pruning saws. *P. occidentalis* has been observed to suffer from the blight in North Carolina, Virginia, and Mississippi.

The organism responsible for bleeding canker of Norway maples (*Acer platanoides*) and other *A.* spp. in Rhode Island, Massachusetts, and New Jersey has been identified as *Phytophthora cactorum* [*R.A.M.*, xvii, p. 713]. In the writer's opinion, however, basal trunk rot of *Rhododendron* caused by *P. cryptogea* presents closer analogies with the maple canker.

Wolf (F. A.). **Cercospora leafspot of Red Bud.**—*Mycologia*, xxxii, 2, pp. 129–136, 2 figs., 1940.

A leafspot, commonly attributed to *Cercospora cercidicola*, with which *C. cercidicola* var. *coremioides* is considered to be synonymous, is stated to be the most conspicuous disease of red bud (*Cercis canadensis*) within the area comprising the Duke Forest [North Carolina]. In addition to the parasitic conidial stage a perithecial stage was observed, identical with *Sphaerella cercidicola*, which is renamed *Mycosphaerella cercidicola* n. comb. [with an emended diagnosis]. The spermogonia and carpogonia that initiate the perithecia develop in late summer and early autumn, and the perithecia mature by late March or early April of the succeeding spring. Pure cultures of the organism remained sterile. The pathogenicity of the fungus and the genetic connexion between the two stages was demonstrated in infection experiments, in which crude inoculum was used.

Ray (W. W.). **A new species of Taphrina on Alder.**—*Mycologia*, xxxii, 2, pp. 155–158, 2 figs., 1940.

A new species, *Taphrina macrophylla*, is described [with a Latin diagnosis] on *Alnus rubra* in California, this being the third of this genus on that host [cf. *R.A.M.*, xviii, p. 414]. The young leaves are affected in the spring, becoming greatly enlarged, often to several times their normal size, curled, and distorted, with a decided purple colour. After the ascospores are discharged the leaves shrivel, dry up, and fall, and then a new crop of healthy leaves is produced. The asci are cylindrical, rounded to truncate at the apex, and measure 40 to 55 by 12 to 19 μ; the ascospores measure 2·5 to 5·5 by 2 to 5 μ.

Stephens (R. P.) & Goldschmidt (W. B.). **A preliminary report on some aspects of Wattle pathology.**—*J. S. Afr. For. Ass., 1939*, 2, pp. 31–43, 3 pl., 1939.

The most serious disease of wattles (*Acacia mollissima* and *A. decurrens*) in South Africa is stated to be gummosis, the primary cause of which is unknown. Van der Byl has shown (*Sci. Bull. Dep. Agric.*

S. Afr., 4, 1914) that the first external symptom is the development on the cortex of blackish depressions, often exuding copious amounts of gum, corresponding to a breakdown in the phloem tissue, about halfway between the cambium and periderm. The general aspect is one either of mottling, which may extend many feet up the bole of the tree, or of butts discoloured by the presence of large, black, cracked patches gradually encircling the tree and involving the bole for a long distance. Partial or total recovery may ensue, but usually any secondary meristem, formed by the tree in an attempt to isolate the diseased condition, itself becomes affected and in severe cases the trouble spreads inwards to the cambium, eventually causing death. Van der Byl reports the disease as having been present in Natal since 1908 or 1909, but the ex-Conservator of Forests for Natal, Zululand, and the Orange Free State informs the writers that it was observed several years earlier in the Eastern Cape Province. To-day gummosis occurs on all types of soil and under the most varied conditions, the only factor definitely associated with an enhanced incidence being an excess of soil moisture, though a tendency to increased severity on old native kraal sites has frequently been noted. Trees of any age may suffer from the disease, which is most prevalent, however, among those of $2\frac{1}{2}$ to 5 years old.

The 'Albert Falls disease' may be recognized either by the general yellowing or slight withering of all the foliage on a tree or by the death of only one or two branches. Within 5 to 15 days of the appearance of these signs even the most vigorous trees die. The most susceptible age seems to be between one and five years. Among the fungi isolated from diseased material were a *Pestalozzia*, a *Fusarium*, *Schizophyllum commune* [*R.A.M.*, xix, p. 175], and *Diplodia natalensis*, which is also associated with collar rot of wattles, first reported from the eastern Cape in 1930 [ibid., xvi, p. 787].

The study of these diseases is considered to be of immediate practical importance.

Brener (W. H.). **Multiple use sprayer for the application of liquid fertilizers, insecticides, and soil disinfectants in forest nurseries.**—*J. For.*, xxxvii, 8, pp. 630–631, 1 fig., 1939.

Particulars are given of a mechanical sprayer for the application, e.g., of sulphuric acid, formaldehyde, or other fungicides used against damping-off [*Pythium de Baryanum*, *Corticium solani*, &c.], in forest nurseries at sowing time. The equipment, which treats 400 standard seed-beds per hour or 4 acres per diem at the Wisconsin Central State Forest Nursery, consists of a 200-gal. Meyers' wooden tank mounted on a second-hand $1\frac{1}{2}$ ton truck. The tank is furnished with a pressure pump and a powerful agitator. The liquid is distributed through two horizontal pipes with $\frac{1}{16}$ in. nozzles, the normal rate of application being 1 gal. per 100 sq. ft.

Hahn (G. G.). **Dasyscyphae on conifers in North America. IV. Two new species on Douglas Fir from the Pacific coast.**—*Mycologia*, xxxii, 2, pp. 137–147, 2 figs., 1940.

In a further contribution to this series [*R.A.M.*, xiv, p. 266], descriptions [with Latin diagnoses] are given of two new species of *Dasyscypha*,

namely, *D. pseudotsugae* and *D. ciliata*, found on Douglas fir [*Pseudotsuga taxifolia*] on the Pacific coast. *D. pseudotsugae* was found to be definitely associated with cankers and roughened bark of living trees, although no experiments were undertaken to determine whether the cankers were caused by it. The fungus occurs on suppressed trees or those growing on poor sites, in various areas from California to British Columbia. It is most closely related to *D. calyciformis*, but differs from it in its host relationship and spore characters; its conidia occur abundantly and germinate readily within 24 hours, while those of *D. calyciformis* germinate with great difficulty. Conidial fructifications of *D. pseudotsugae* were readily produced in pure culture. Present observations indicate that *D. pseudotsugae* and the cankers it is associated with have little pathological importance.

D. ciliata is a saprophytic species and occurs not very abundantly in the Pacific Northwest. It is restricted in its growth to the small shaded-out, dead branches and twigs. An imperfect stage is apparently lacking in the life-history of this fungus.

Wirka (R. M.). **Preservation of timber by the steeping process.**—[*Publ.*] *For. Prod. Lab., For. Surv., U.S. Dep. Agric.*, 9 pp., 1 fig., 1939. [Mimeographed. Received June, 1940.]

Full directions are given for the preservation of timber by steeping in solutions of zinc chloride, mercuric chloride, sodium fluoride, and water-soluble proprietary disinfectants, supplemented by tabulated treatment and service data on fence posts of various kinds of wood treated with one or other of the chemical compounds recommended for this purpose.

Mason (L.). **'Ascu' wood preservative.**—*Curr. Sci.*, ix, 4, pp. 187–188, 1940.

The author states that the withdrawal of the publication entitled '"Ascu"—a wood preservative' by the Forest Research Institute, India [*R.A.M.*, xix, p. 378], became necessary to prevent large-scale failures due to users repeating mistakes made in the past, which may possibly have resulted in some way from information given in the publication in question. The Institute, it is emphasized, has not completely condemned ascu.

The originator of the process stated that any illiterate *mistri* could work an ascu-treating plant, but experience has shown that such is not the case. Another difficulty has arisen in the changes in composition and concentration that take place in the ascu solution when in contact with wood. These changes are not the same for all species, and with some the variations are considerable, so much so that after only one treatment the solution in the service tank may have been rendered almost useless. The treatment originally recommended, at a low pressure for 15 minutes, has been found inadequate in practice to secure complete penetration and good absorption even in the perishable sapwood of some species. Other factors, some of them mentioned in the withdrawal note, have also come to light.

The Institute considers that until the difficulties presented by the

new preservative are more completely understood it cannot endorse its use indiscriminately.

Bier (J. E.). **Studies in forest pathology. III. Hypoxylon canker of Poplar.**—*Tech. Bull. Dep. Agric. Can.* 27 (*Publ.* 691), 40 pp., 9 pl., 1 map, 1940.

During the past eighteen years, canker of aspen poplar (*Populus tremuloides* and *P. grandidentata*) due to *Hypoxylon pruinatum* [*R.A.M.*, xviii, p. 1] has been reported on many occasions in widely separated areas in Canada and the United States, from the Atlantic coast to Alberta, in Minnesota, and in every stand examined in Ontario.

The fungus invades the young bark and cambium of the trunks and branches, forming cankers (found on trees up to 65 years old) which girdle and kill the affected structures and cause the death of all distal parts. In old trees the trunk cankers occur in the upper part of the bole, indicating that susceptibility depends on the age of the bark. The cankers are found quite commonly on the healthy, rapidly growing members of a stand, as well as on weakened trees. In the vicinity of Toronto incipient cankers are always associated with wounds, punctures by a wood-boring beetle, a species of *Oberea*, usually providing means of entry. The cankers make faster growth along than around the trunks and branches. Trunk cankers on 10- to 15-year-old trees are generally at least 3 ft. long before the trees are girdled.

Ascospore discharge was observed to take place most actively immediately after rain, the length of the discharge period averaging from 20 to 30 hours following a heavy rain. The asci were discharged in rapid succession, from 45 to 61 being observed to discharge in one minute. In most instances a single ascus passes through the ostiole at one time and the spores are discharged after the top of the ascus and the uppermost one or two spores have passed through the ostiole. Not infrequently an ascus passed through intact, and if not washed away such asci formed a black mound surrounding the ostiole.

The fungus was isolated in pure culture from ascospores, conidia, and diseased bark. Inoculations on wounded and unwounded bark of healthy aspens with mycelium from these three sources gave positive results on the wounded tissue only. Cultures of *H. pruinatum* were obtained from diseased bark isolations from the margins of artificially produced cankers. The imperfect fructifications became apparent on the induced cankers at the end of the first, or during the second, growing season. The primary perithecial stromata developed about three years after inoculation. The perfect stage formed at all seasons. Trees 4 to 7 in. in diameter were girdled and killed three and a half years after experimental inoculation. Natural cankers frequently develop the conidial stage in their first year's growth, but the perfect stage was found only on cankers at least three years old.

Day (W. R.). **Forest pathology section.**—*Rep. Imp. For. Inst., Oxford, 1938–39*, pp. 15–18, 1939.

In this report it is stated that the dying of 70-year-old Douglas fir [*Pseudotsuga taxifolia*] in the New Forest was due in one case to lightning injury, possibly assisted by *Phomopsis pseudotsugae*, and in

another to unsuitable soil conditions, with *Adelopus gaeumanni* [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 425] as a possible contributory factor. With reference to the second case, it is pointed out that in certain difficult soils, owing to a variable water table, older trees are unable to maintain a permanent root system, except in the poor, dry surface layers, and as a result cannot survive unfavourable seasons without becoming diseased. *P. gaeumanni* has been observed in Devonshire, Somerset, North Wales, and Roxburghshire.

Preliminary work is now in progress on the widespread failure of young European larch plantations in England [ibid., xix, p. 179]. Inoculations of European larch in co-operation with G. G. Hahn, using a strain of the larch canker fungus identified by him as *Dasyscypha willkommii* [ibid., xviii, p. 74], caused die-back and necrosis of small twigs in the absence of frost injury.

F. H. Jones obtained clear evidence that a chlorosis of beech in the Thames valley was due to iron deficiency; much, if not all, of the chlorosis of beech prevalent on chalky soils probably results from the same cause.

A preliminary survey of a serious root rot of *Thuja plicata* in the Forest of Dean, necessitating early felling in some places, indicated that the condition is mainly due to *Armillaria mellea*.

Report of Lands, Parks, and Forests Branch for the fiscal year ended March 31, 1939.—*Rep. Dep. Min. Resour. Can. 1938–9*, pp. 68–167, 1940.

In Canada the remaining stand of eastern white pine (*Pinus strobus*) is largely centred in Ontario and western Quebec, where control of *Cronartium ribicola* [*R.A.M.*, xix, pp. 176, 314] is simpler than on the Atlantic seaboard or the Pacific slope, owing to the relative dryness of the climate in Ontario, and the scarceness of domestic black currant bushes on the largely unsettled Crown lands. Experimental evidence indicates that *Ribes* eradication is feasible in these eastern areas, where the *P. strobus* stand is estimated at about 8,000 million board ft. of saw material and 10 million cords of pole timber.

Jack pine [*Pinus banksiana*] railway sleepers were inspected in 1938 after 13 years' service. The renewals among untreated sleepers through decay amounted to 81·9 per cent. for sleepers affected with red rot due to *Fomes pini* [ibid., xv, p. 330; xviii, p. 73] and 83·8 per cent. for sleepers not so affected, the corresponding figures for creosoted sleepers being 3 and 0 per cent. A study is being carried out to determine whether *F. pini* continues development in red-stained wood so as to produce red rot under conditions found in sleepers in service. Examination of cultures from sleepers removed from an experimental track in 1937 indicated that during the eight-year service period of the experiment *F. pini* and fungus No. 2 were gradually dying out in the untreated sleepers, numerous moulds and secondary wood-destroying fungi entering in their place. These sleepers mostly showed advanced decay. Of the wood-rotting fungi *Lenzites sepiaria* was the most common and active.

Petri dish tests indicated that lead fluosilicate and zinc fluosilicate were approximately three times as toxic as zinc chloride and a mixture

of zinc chloride and sodium dichromate, but in wood-block tests there was little, if any, difference in toxicity.

A cheap preservative treatment for the butts of telephone poles has been devised. Longitudinal holes are bored close together in the butts near the circumference, and alternate holes are filled with copper sulphate and sodium arsenite pastes and plugged. The poles are treated and set up as soon as possible after being cut, and the bark is left on up to the ground line. Evaporation of moisture from the top draws the preservatives up the sapwood. The adjacent copper and arsenic salts are water-soluble, but do not soon become exhausted, as the slightly soluble cupric arsenite is precipitated by diffusion, with the result that the treatment remains effective for several years. After five years' service treated poles were still in good condition, though the untreated controls were decayed at ground-level. The method has been commercially applied to 1,600 poles in a power-line.

In sleepers removed after nine years' service, only a small percentage of zinc chloride remained in those treated with an average of ½ lb. zinc chloride per cu. ft. Decay was progressing under the rail-seat.

To test the validity of the widely held view that pine lumber made from logs which have been river-driven or stored for prolonged periods in water does not develop blue stain [ibid., xviii, p. 363] as readily as that made from logs not leached by water, an experiment was conducted in the summer of 1938 with red pine and white pine logs. The results tended to support the view tested, but further tests are required before final conclusions can be reached.

Schnell (R.). **Observations sur deux 'balais de sorcière' de l'Épicea.** [Observations on two 'witches' brooms' of Spruce.]—*Bull. Soc. bot. Fr.*, lxxxvi, 5–6, pp. 318–323, 1 fig., 1 diag., 1939.

Full particulars are given of the anatomical structure of two witches' brooms of spruce (*Picea excelsa*) [*P. abies*] corresponding to those described by v. Tubeuf [*R.A.M.*, xvii, p. 493], one collected in the Vosges in 1936 and the other in the Juras in 1937.

Wilson (J. D.). **The fixed coppers as a new weapon for use in the fight against vegetable diseases.**—*Market Gr. J.*, lxvi, 8, pp. 206–210, 1940.

The dust formula now being recommended in Ohio for the control of most vegetable diseases consists of 6 per cent. metallic copper, 15 per cent. wheat flour, and the balance talc or some other suitable filler, e.g., clay, whiting, gypsum, or bentonite. In practice this involves the use of 12 lb. of a fixed copper compound with a 50 per cent. copper content, 15 lb. wheat flour, and 73 lb. talc for ordinary purposes, but cucurbits should be given a lower dose of copper (8 lb.). The fixed coppers may also be substituted for Bordeaux on crops sensitive to injury by this material, a typical spray formula being composed of 4 lb. copper compounds, 4 lb. wheat flour, and the prescribed quantity of a standard spreader per 50 gals. water, though a 2–4–50 spray or the 12–15–73 dust is effective against tomato, celery, pepper [*Capsicum annuum*], and beet leaf spots [*Septoria lycopersici*, *S. apii*, *Cercospora capsici*, and *C. beticola*].

Krebs (W.). **Verhütung von Krankheiten in der Pflanzenanzucht.** [Disease prevention in plant cultivation.]—*Blumen- u. PflBau ver. Gartenwelt*, xliv, 6, p. 53, 1 fig., 1940.

Generally speaking, the writer has found liquid fungicides more reliable than dusts in the treatment of vegetable seeds, uspulun and ceresan being the most widely used (in Schleswig-Holstein). Great care must be taken not to exceed the prescribed concentration and immersion period (0·25 per cent., one hour, in the case of uspulun); however, for beans [*Phascolus vulgaris*], peas, and carrots the duration of the dip should not exceed 30 minutes and for tomatoes 20, otherwise germination will suffer. Celery scab [*Phoma apiicola*: *R.A.M.*, xiii, p. 73] is best controlled by 24 hours in a solution of 20 gm. copper sulphate in 1 l. water, together with the disinfection of walls, frames, and benches with 2 to 5 per cent. formaldehyde or 10 per cent. soda. Blackleg of cabbage [*Pseudomonas campestris*] may be combated by watering with 0·1 to 0·25 per cent. uspulun or by the application of brassicol to the soil at the rate of 20 gm. per sq. m. The latter preparation is also useful against lettuce rot [*Sclerotinia minor*: see below, p. 512] and onion smut [*Urocystis cepulae*].

Moericke (V.) & Winter (G.). **Eine Virose des Blumenkohls in Deutschland.** [A Cauliflower virosis in Germany.]—*Z. PflKrankh.*, l, 3–4, pp. 172–177, 4 figs., 1940.

During the summer of 1938 the writers observed in the Bonn and Cologne districts of Germany a virus disease of cauliflowers causing up to 90 per cent. infection, the very variable symptoms of which, including dark green strips along the leaf veins, bordered by narrow, yellowish zones, curving of the midrib, and 'savoying' or total malformation of the leaves, appear to relate it to the mosaic described by Tompkins from California [*R.A.M.*, xvii, p. 6]. Features apparently peculiar to the local strain of the virus are broad, pale strips along the veins and necroses of the apical margin, combined with an almost slipper-like backward bending of the upper edge and swellings of the intercostal areas. Similar mosaic-like symptoms have been observed on Brussels sprouts, Savoy cabbage, and kohlrabi (severe on the last-named). Positive results were given by transmission experiments (rubbing the abraded leaves of healthy plants with diseased juice) after an incubation period of 18 to 20 days on 11 cauliflower varieties, white and red cabbage, and Brussels sprouts, the two last-named hosts sustaining particularly heavy damage.

Bremer (H.). **Beobachtungen quantitativer Art über das Auftreten von Schäden an Gemüsepflanzen, auf dem Versuchsfelde der Zweigstelle Aschersleben der Biologischen Reichsanstalt für Land- und Forstwirtschaft während der Jahre 1929 bis 1935. 1. Mitteilung.** [Observations of a quantitative character on the occurrence of injuries to vegetable plants on the experimental field of the Aschersleben branch of the Biological Institute for Agriculture and Forestry during the years 1929 to 1935. Note 1.]—*Z. PflKrankh.*, l, 2, pp. 71–84, 1 graph, 1940.

Most of the observations in this paper deal with insect pests, but the

following item concerning club root of cabbage (*Plasmodiophora brassicae*) is of interest. During the period covered by the investigations, not a single case of the disease was detected, and numerous inoculation tests conducted with the fungus in the field failed. The absence of the pathogen is characteristic of the entire vicinity of Aschersleben, i.e., the northern foothills of the Harz Mountains and the adjoining fertile plain of Magdeburg, the typical soil of which is loess, containing 12 to 15 per cent. carbonate of lime in a state of exceedingly fine division and consequently giving a neutral to weakly alkaline reaction. Large-scale trials are in progress to determine the factor conferring immunity on the local soils as compared with those of a similarly alkaline reaction in other places where the disease appears to be rife [*R.A.M.*, xi, p. 16].

CHAMBERLAIN (E. E.). **Turnip mosaic. Extended host range and identity.**—*N.Z. J. Sci. Tech.*, xxi A, 4, pp. 212–223, 7 figs., 1939.

Turnip mosaic in New Zealand [*R.A.M.*, xviii, p. 234] was transmitted by inoculation with sap or through *Myzus persicae* to the following new hosts: stock (*Matthiola incana*), wallflower (*Cheiranthus cheiri*), white mustard, water cress, *Capsella bursa-pastoris*, *Lepidium ruderale*, *Sisymbrium altissimum*, *Cardamine heterophylla*, *Coronopus didymus*, and *Nicotiana glutinosa*. Naturally infected white mustard, stock, and wallflower plants all showed stunting. In addition, white mustard showed a pronounced light and dark green mosaic of the leaves, the dark green areas being often raised, producing a blistered, crinkled appearance; in the glasshouse these symptoms are preceded by vein-clearing of the young leaves. Infected stock plants showed abnormally small, slightly crinkled leaves, with an inconspicuous mosaic which gives them a stippled appearance, and in severe cases the leaves tended to roll upwards at the margins; the flowers were 'broken', white streaks appearing on self-coloured flowers. Leaves of wallflower plants were small and slightly crinkled, showed an indistinct mosaic mottling, and were curled downwards at the tips; a bunched appearance was produced by curling and proliferation of the foliage; flowers were 'broken', with yellow streaks on deep red or brown flowers. Symptoms are also described on experimentally infected hosts. Since the disease is so readily transmitted to weed hosts it is probable that the virus overwinters in them.

The virus remained viable *in vitro* for two but not three days, tolerated dilution to 1 in 100 but not 1 in 1,000, and was inactivated by ten minutes' exposure to a temperature of 55° to 60° C. Turnip mosaic in New Zealand thus closely agrees with cabbage black ring [ibid., xviii, p. 364] in methods of transmission, insect vectors, physical properties, and host range. There are, however, some points of difference: black ring produces chlorotic and necrotic rings on the foliage of cabbage, cauliflower, and other plants, whereas turnip mosaic causes only a faint mosaic mottling on the leaves of these hosts; in the United States black ring occurs naturally on cabbage, cauliflower, broccoli, and Brussels sprouts, while the New Zealand turnip mosaic occurs in the field only on the swede, turnip, rape, white mustard, stock, and wallflower.

VIRGIN (W. J.) & WALKER (J. C.). **Relation of the near-wilt fungus to the Pea plant.**—*J. agric. Res.*, lx, 4, pp. 241–248, 1 pl., 3 figs., 1940.

In further studies on 'near-wilt' of peas (*Fusarium oxysporum* f. 8) in Wisconsin [*R.A.M.*, xix, p. 253] the causal fungus was found to penetrate the young seedlings of both resistant and susceptible pea varieties most commonly at the root tip and the cotyledonary node, but occasionally at almost any point along the root and epicotyl. Under certain conditions, not yet determined, the fungus was able to produce a definite seedling root rot. Upon entering the plant the progress of the fungus was largely confined to the xylem vessels. In many of the susceptible varieties the fungus was found to travel the entire length of the stem, while in the case of the resistant Rogers K and some of its hybrids the pathogen did not advance beyond the eighth node. The fungus reaches the seeds of diseased plants through the vascular system. It was found both in the seed coats and cotyledons. It is believed that dwarf, late-maturing, susceptible varieties are more likely to produce infected seed when grown in infested soil than are the early-maturing ones. There is little doubt that seeds infected by the near-wilt organism will produce diseased plants.

NOLL (W.). **Über weitere Befallsymptome und Massnahmen zur Verhütung von Schäden durch Ascochyta pinodella Jones, A. pisi Lib. und Mycosphaerella pinodes (Berk. u. Blox.) Stone bei Erbsen.** [On additional symptoms of infection and measures for the prevention of damage by *Ascochyta pinodella* Jones, *A. pisi* Lib., and *Mycosphaerella pinodes* (Berk. & Blox.) Stone on Peas.]—*Z. PflKrankh.*, l, 2, pp. 49–71, 8 figs., 1940.

Continuing his studies at the Bonn Phytopathological Institute on the infection of peas by foot rots (*Ascochyta pinodella*, *A. pisi*, and *Mycosphaerella pinodes*) [*R.A.M.*, xviii, p. 831], the writer differentiates the symptoms caused by these pathogens as follows. *A. pinodella* strews the pods with minute, brown to black dots, scattered obliquely to the longitudinal axis, coalescent over large areas, and forms unicellular conidia in pycnidia distributed at random. *A. pisi* produces circular spots up to 9 mm. in diameter, with blackened and thickened edges and pale centres, the latter densely studded with pycnidia giving rise to bicellular conidia. In the case of *M. pinodes* the lesions are also circular, but brown (never black), up to 7 mm. in diameter, often concentrically zonate with a darker centre and an ill-defined margin; the pycnidia, extruding bicellular conidia, are strewn over the whole spot but more densely near the edge.

In a sample of 200 diseased Konserva–Mark seeds (1936) the average percentages of infection by *A. pinodella*, *A. pisi*, and *M. pinodes* were 35·5, 29·5, and 36·5, respectively. In 1938 the average germination of five 1936 samples attacked by the three fungi was 10, 50·7, and 7·8 per cent., respectively, as compared with 61·2 per cent. for sound seed. In agar cultures the germination percentages of seed infected by *A. pinodella*, *A. pisi*, and *M. pinodes* were 9·7, 34·5, and 11·3, respectively, as against 96·9 for the healthy controls.

Severely infected seeds bear a single, ill-defined, dirty yellow to

greyish-brown or black, wrinkled spot (occasionally several) on the side in contact with the pod wall, sometimes involving the cotyledonary leaves. The lesions due to *A. pisi* are less conspicuous than those of the two other pathogens, but a differential diagnosis on this basis is scarcely feasible.

The use of healthy seed of approved germinability (preferably not home-grown in districts with a humid climate) is the best control measure, but treatment with a disinfectant dust, e.g., abavit-neu, fusariol 1454a, or ceresan U.T. 1875a (all at the rate of 2 gm. per kg.) somewhat improved the germinative capacity of weakly infected seed in 1938, the average increase from the three preparations being 14·5 per cent. *A. pisi*, shown by other tests to be the weakest of the three parasites under discussion, proved to be likewise the most amenable to fungicidal treatment. Peas immediately following peas are much more liable to damage than those preceded in the rotation by some other crop.

On the whole, field peas such as Hohenheimer rosablühende Futter and Peragis (*Pisum arvense*) were more resistant to *A. pinodella* in inoculation experiments than the table varieties, the most satisfactory of which in this respect were Nordost frühe grüne, Schorr's Rappoldshofer Viktoria, Delikatess, and Hohenheimer grüne Viktoria.

Chamberlain (E. E.) & Baylis (G. T. S.). **The occurrence of Onion yellow-dwarf in New Zealand.**—*N.Z. J. Sci. Tech.*, xxi A, 4, pp. 229–236, 4 figs., 1939. [Received April, 1940.]

Onion yellow dwarf, recently found in the Marshland district, New Zealand [*R.A.M.*, xix, p. 70], is stated to be confined to this district, where infection varies from a trace to 50 per cent., and to a seed-producing area at Blenheim. The disease has been observed on the principal varieties Turbott, Pukekohe Longkeeper, and Brown Globe. The symptoms agree closely with those described in America [ibid., viii, p. 350] and in Germany [ibid., ix, p. 223]. The leaves of infected plants become flattened, crinkled, and drooping, and later develop narrow longitudinal streaks; the bulbs are, on the average, smaller than those of healthy ones. The same foliage symptoms persist on second-year plants, flower stalks being sometimes streaked and bent or twisted, although remaining cylindrical. Infected first-year plants usually appear in groups or roughly circular patches within which 80 to 100 per cent. of the plants are diseased. In cases of heavy infection the patches coalesce and the disease becomes more or less general. The virus was successfully transmitted to onion and shallot by artificial inoculation (by the sand-abrasion, but not the tissue-insertion method) and by the aphids *Myzus persicae* and a related species, *Aphis laburni*, and *Macrosiphum solanifolii*. In the field the disease was observed only on onions, and no attempt was made to transmit it experimentally to any plant other than shallot. The fact that the disease appeared at Blenheim in all seed crops planted with bulbs from a diseased Marshland field indicates that the virus overwinters in bulbs. In order to effect the eradication of the disease the following control measures have been enforced: growing of onion seed crops and shallots in the Marshland district is prohibited; growers are instructed to destroy after harvest all injured or otherwise worthless onion bulbs, to lift the shallots, which may be sold for pickling

only, and not to grow jonquils [*Narcissus jonquilla*] in the vicinity of onion crops.

FRICKHINGER (H. W.). **Ursache und Verhütung der Salatfäule.** [Cause and prevention of Lettuce rot.]—*Kranke Pflanze*, xvii, 3–4, pp. 27–28, 2 figs., 1940.

The heavy damage inflicted on lettuce crops in Germany by *Sclerotinia minor* [*R.A.M.*, xvii, p. 433] may be combated by soil disinfection with 2 to 3 per cent. formalin, 0·25 per cent. uspulun (10 l. per sq. m.), or brassicol [ibid., xix, p. 361] (40 to 50 gm. per sq. m.), supplemented by preventive cultural and sanitary measures.

LING (L.). **Seedling stem blight of Soybean caused by Glomerella glycines.**—*Phytopathology*, xxx, 4, pp. 345–347, 1 fig., 1940.

In Szechwan Province, West China, soy-bean seedlings are stated to be frequently killed by the anthracnose fungus, *Glomerella glycines* [*R.A.M.*, xix, p. 256], shortly after emergence, when dark cankers appear on the cotyledon and spread downwards to the hypocotyl, causing decay and collapse of the young stem. Under humid conditions setose, black acervuli are produced in abundance on the lesions. Inoculation experiments by three methods: (1) one hour's immersion of the seed in a spore suspension; (2) pouring a spore suspension over the soil; and (3) mixing a fungus culture with the soil gave the following results in (*a*) sterilized and (*b*) unsterilized soil: (*a*) 100, 94, and 95 per cent., respectively, of the plants killed after emergence by (1), (2), and (3), respectively, compared with 3 per cent. in the controls: (*b*) 100, 38, 72, and 9 per cent., respectively. The primary source of infection is the mycelium, which survives in the seed for one to two years and has been experimentally shown to remain active in inoculated potted soils from the late autumn until the following spring. The conidia, on the other hand, are short-lived, withstanding desiccation only for 6 to 12 hours and rapidly losing their viability (no germination after 24 hours and only 2 per cent. after 18) even in their own matrix. The ascigerous stage of *G. glycines* has not yet been observed locally.

MAIER (W.) & MITTMANN-MAIER (G[ERTRUD]). **Die Verteilung und Häufigkeit der kurzen Internodien und der Doppelknoten bei reisigkranken Reben.** [The distribution and frequency of short internodes and double nodes in 'reisig'-diseased Vines.]—*Wein u. Rebe*, xxi, pp. 251–272, 1939. [Abs. in *Z. PflKrankh.*, l, 3–4, pp. 221–222, 1940.]

Shortened internodes and double nodes may be formed on any internode of a 'reisig'-diseased vine shoot [*R.A.M.*, xix, p. 67], but were found in the writers' investigations to predominate in certain sites. Thus, 72 per cent. of the total number of shortened internodes were found along the tenth internode and those immediately above and below it, while 83 per cent. of the double nodes were situated between the 9th and 14th. These relationships remain regular in different seasons and in widely separated districts. The abnormalities in question may involve over 90 per cent. of the shoots on every vine in a given vineyard.